Industry Culture:
A Need for Change

Report 2001-008-C-05

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Research Program C:
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PREFACE

The Cooperative Research Centre for Construction Innovation (CRC CI) research project 2001-008-C: *'Project Team Integration: Communication, Coordination and Decision Support'*, is supported by a number of Australian industry, government and university based project partners including: Queensland University of Technology (QUT); Commonwealth Scientific Industrial Research Organisation (CSIRO), University of Newcastle; Queensland Department of Public Works (QDPW); and the Queensland Department of Main Roads (QDMR).

Supporting the project's research aims and objectives, and as a major deliverable for the project, this report is not intended as a comprehensive statement of the construction industry's need or ability to change its existing culture. Rather, this report provides an overall snapshot of 'general' industry organisation experiences, characteristics and cultural attributes towards implementing a cultural or technological driven change, and considered as 'background literature' to an on-going and in-depth PhD investigation into AEC industry specific organisations and project team member values, attitudes and beliefs, etc. towards a technology driven culture change.

EXECUTIVE SUMMARY

Research indicates, one of the last available 'mechanisms' left for organisations to improve their competitive position within the construction industry is by considering its people (culture) along with its technology (Schein E. H. 1997). In other words, if one wants to make construction industry organisations, groups and project teams more efficient and effective, then one must better understand the role that culture plays within them.

The better understanding of culture "*helps generate insight into the organising activity that would be overlooked or presented differently in other approaches*"
(Pepper G. L. 1995) p29

The transformation of personalities (culture) and traditional processes is not easy, characteristically hindered by the industry's unique and determined way of 'doing things' the way it always has, and by its deeply embedded and resistive nature to change. Hence, due to an industry culture being notorious for continuously challenging the successful implementation of innovative change, one of the main objectives of the 2001-008-C (Part B) research project undertaking, is to identify, examine and better understand the 'deeply embedded' culture of today's construction industry, its organisations, teams and participants. That is to say, this report focuses on the 'general' needs, opportunities and subsequent changes necessary to, for example, effectively apply innovative information and communication technologies (ICTs) to current / traditional industry practices and processes. To follow, a summary of this report's findings:

Culture is identified as one of the most difficult and complex approaches to understand. This is mainly due to culture being defined in so many different and sometimes conflicting ways (Pepper G. L. 1995). Culture is commonly identified as "*a set of mores, values, attitudes, beliefs, and meanings that are shared by the members of a group or organisation*", and is often the primary way in which one 'group' (organisation, team, etc) differentiates itself from others (Williams A., Dobson P. et al. 1993; Duarte D. L. and Snyder N. T. 2001).

Change has always been and remains difficult. Organisations will change only as far and as fast as its collective individuals are willing to change, because people are and always will be 'instinctively programmed' to resist any change. Therefore, to change any organisation strategically and successfully, one must first attempt to change the individual beliefs, attitudes and values (culture) within the organisation before the organisation as a whole can benefit (Black J. S. and Gregersen H. B. 2002). Yet, culture is known as being '*complex'*, '*multi-levelled*' and '*deeply rooted*,*'* a concept that must be observed and analysed at its every level before it can be fully understood or successfully changed and managed (Williams A., Dobson P. et al. 1993; Schein E. H. 1999).

"*Culture change is likely to become more, rather than less, significant over the coming decade. Increasingly though, organisations will have to treat such change, not as a one-off, discrete phenomenon, but as a continuing process which constantly reviews, refines and improves the organisation's overall capacity to respond to external developments*"
(Williams A., Dobson P. et al. 1993) p xi

A number of **drivers of change** have been identified during this investigation and discussed in greater detail within this report under the following headings: Motivation; Leadership; Beliefs and Rewards; and Training and Education. Similarly, the **barriers of change** identified are discussed under the following two headings: Technology and Culture.

Trends and recommendations identified during this investigation are divided into two main sections (cultural and technological):

Cultural: Changing culture is inevitably a slow process, where the all too common phrase “you can’t change culture overnight” becomes a major excuse for not changing culture at all. In many cases organisations have attempted to change their culture, and employees only learn the basics of this ‘new’ culture without fundamentally altering their ‘old’ culture (beliefs, values, and attitudes, etc). As such, the ‘new’ culture is only superficially different from the old, and where it is only a matter of time before the traditional ‘ways of doing things’ resurface (Williams A., Dobson P. et al. 1993). Additional recommendations and discussions are provided within this report in an attempt to help overcome these ‘excuses’ for not changing existing cultures.

Technological: Similar to the above, additional recommendations and discussions are provided within this report in an attempt to help overcome the technical ‘excuses’ for not changing existing cultures, by elaborating on issues such as: the transition from paper to electronic; identifying and introducing improved implementation processes; the need to overcome the ‘perceived fear’ of ‘exploitation’ of technology-led innovations within the industry; the need to increase and strengthen the process of realising ICT adoption benefits by providing new direction; and the need for improved training and education.

Continuing research activities will attempt to demonstrate leadership in facilitating the use of innovative ICTs in virtual building and civil construction teams. This report is a preliminary literature investigation into ‘general’ public and private industry organisational need for culture change. Where ‘general’ industry organisation experiences, characteristics and cultural attributes (as identified in this investigation) are considered ‘background literature’ to an on-going and in-depth PhD investigation into AEC industry specific organisations and project team member values, attitudes and beliefs, etc. towards a technology driven culture change. The ongoing PhD research activities focus on identifying and clarifying the ‘need’ for change by examining AEC industry specific cultural and sub-cultural ‘threats’ and ‘opportunities’ that challenge the successful uptake of innovative Information and Communication Technology (ICT) solutions within and between organisations and project teams.

“When we know what culture is, we know what needs to be changed for culture to change. Only once we appreciate its nature can we understand how it might be changed. When we know its role, we can comprehend its importance”
(Williams A., Dobson P. et al. 1993) p11

1 INTRODUCTION

Research shows that the construction industry is a major adopter of information and communication technology (ICT) tools and systems (Internet, computers, mobile telephones, etc), experiencing increased benefits for a wide range of its member's day-to-day activities. Yet, there is still significant room for improvement. Organisations, for example, that have the supposed 'optimum' ICT implementation or change strategy may find it worthless, because the organisation's culture is not properly aligned with, and supportive of, the strategy, and therefore, will either stall or simply fail (Schneider W.E. 2000).

Over the past decade, the word 'culture' has dominated the thinking of many managers and become an integral part of their everyday language. In other words, today's global competitive business environment has made the culture of an organisation a critical aspect of its success (Sadri G. and Lees B. 2001). Every organisation within the industry has its own unique culture, sub-culture, character, nature, and identity. It has its own history of success and failures, which reinforces or challenges the organisation's 'way of doing things'. Older and more successful organisations, for example, are said to have stronger cultures, natures, and identity (Meudell K. and Gadd K. 1994; Schneider W.E. 2000). Yet, despite the growing awareness of various cultural issues, little attention is paid to the practical, day-to-day process involved in creating, managing and changing culture (Williams A., Dobson P. et al. 1993).

Research indicates, one of the last available 'mechanisms' left for organisations to improve their competitive position within the construction industry is by considering its people (culture) along with its technology. In other words, if one wants to make construction industry organisations, groups and project teams more efficient and effective, then one must better understand the role that culture plays within them (Schein E. H. 1997). By employing a dedicated, highly skilled, flexible, co-ordinated, committed and productive workforce, coupled with a leaner, flatter and more responsive organisation, will ensure a more effective and successful implementation of innovative ICTs (Morley M. and Heraty N. 1995). Current 'secretive' organisational cultures, for example, who see information as a source of power, influence, and importance, and made available only on a 'need-to-know' basis, are to 'transform' themselves into more 'open cultures' where, whilst a degree of control is maintained, there is an atmosphere of mutual trust and respect within and between organisations (Baines A. 1998). Unfortunately, this transformation of personalities (culture) and traditional processes is not easy (Michel H.L. 1998), characteristically hindered by the industry's unique and determined way of 'doing things' the way it always has, and by its deeply embedded and resistive nature to change.

2 PROJECT 2001-008-C (Part B): PROJECT TEAM INTEGRATION: COMMUNICATION COORDINATION AND DECISION SUPPORT

2.1 Research Background

Four decades of international construction industry reports reinforce poor communication, information transmission; coordination; and teamwork issues are the cause of countless performance problems in the construction industry. Failure to achieve significant improvements in what are well-identified issues can be linked to the hitherto limited capacity to conceptualise and manage the very complex dynamics in project processes throughout the project's life cycle.

Debatably, today's industries, businesses and personal worlds are dominated by a wide range of technologies and e-activities, including: computers, email, Internet, Web sites, etc., finding it more and more difficult to function without them. Yet, the success of any profession is described as going beyond simply exchanging electronic information. Successful implementation of information and communication technology (ICT) and innovative web-based e-solutions (such as e-Tender) requires careful consideration to meet industry needs. Where future research and developments (R&D) in determining new and improved ways of doing business through the Internet is dependent on the innovation of the industry (and end user), not only the technology itself – i.e.: matching technological innovation with the perceived needs and preparedness for change on the part of the industry.

Consequently, there is an urgent need to address those key issues that will most significantly influence the construction industry and the way in which it contributes to our society and the economy as a whole in the future. By focusing on the potential of ICT and innovative web-based e-solutions, to better integrate project team members and the construction industry in general.

2.2 Research Aims and Objectives

One of the main objectives of the 2001-008-C (Part B) research project undertaking, is to ***identify, examine and better understand the 'deeply embedded' culture of today's construction industry, its organisations, teams and participants.*** Therefore, due to an industry culture being notorious for continuously challenging the successful implementation of innovative change, this research focuses on identifying and assessing certain cultural factors, needs, opportunities and subsequent changes necessary within the industry and its participants to, for example, effectively apply Information and Communication Technologies (ICTs) to current / traditional work practices and processes. Additional and supporting research aims, objectives and activities of this project - not covered in this report - include:

- Demonstrate leadership in facilitating the use of online technologies for the design, management and construction of building and civil construction projects.
- Identify appropriate ICT solutions that will improve resource management, support and integrate total project life cycle considerations, increase efficiencies on projects, ultimately reduce overall cost and improve project outcomes to project participants in the public and private sectors.
- Test, field trial and/or evaluate ICT systems allowing the above issues to be addressed, evaluated and studied in depth.
- Establish case study projects that will foster the expansion of ICTs in the building and civil construction sectors, thus stimulating the use of such technologies in public and private

building and infrastructure projects – potentially resulting in increased ICT knowledge, awareness and skills of companies in both the public and private sector.

- Demonstrate the benefits and efficiencies obtained through Internet-based Construction Project Management (ICPM) solutions - thereby stimulating improvements and encouraging the wider adoption of such processes in the AEC industries - potentially delivering projects in a timelier and cost efficient manner.
- Demonstrate the potential for the use of hand-held technologies/applications - by examining the existing and emerging technologies not yet embraced by the AEC industries.
- Examine construction industry and Government current state-of-play concerning e-Tendering and ascertain the barriers and enablers from both a technological and end-user perspective.

To help realise the above project aims and objectives, the project schedule (Appendix I) provides a breakdown of projected research activities, deliverables, milestones, and allocated timeframes.

2.3 Industry Culture Report: Aims and Objectives

Supporting the above research aims and objectives, and as a major deliverable for the 2001-008-C (Part B) research project (Figure 11-1), this report explores the various levels, characteristics, classifications and determinants of culture. The report examines both cultural and technological driven change, by identifying various needs, methods, advantages and barriers. Finally, the report provides cultural and technical trends and recommendations in relation to implementing change, and introduces a future and supportive PhD research effort that will further examine the cultural ‘threats’ and ‘opportunities’ that challenge the successful uptake of innovative ICT and Internet-based solutions and processes within project teams.

3 CULTURE

3.1 Why Culture?

Culture is important because "*it is a powerful, latent, and often unconscious set of forces, that determine both our individual and collective behaviour, ways of perceiving, thought patterns, and values*" (Schein E. H. 1999) p14. Decisions made without awareness of these 'operative culture forces', may result in unanticipated and undesirable consequences. Culture needs to be taken seriously to help anticipate consequences and make choices about their desirability (Schein E. H. 1999).

Research identifies at least six reasons why the study of an organisation's culture is important:

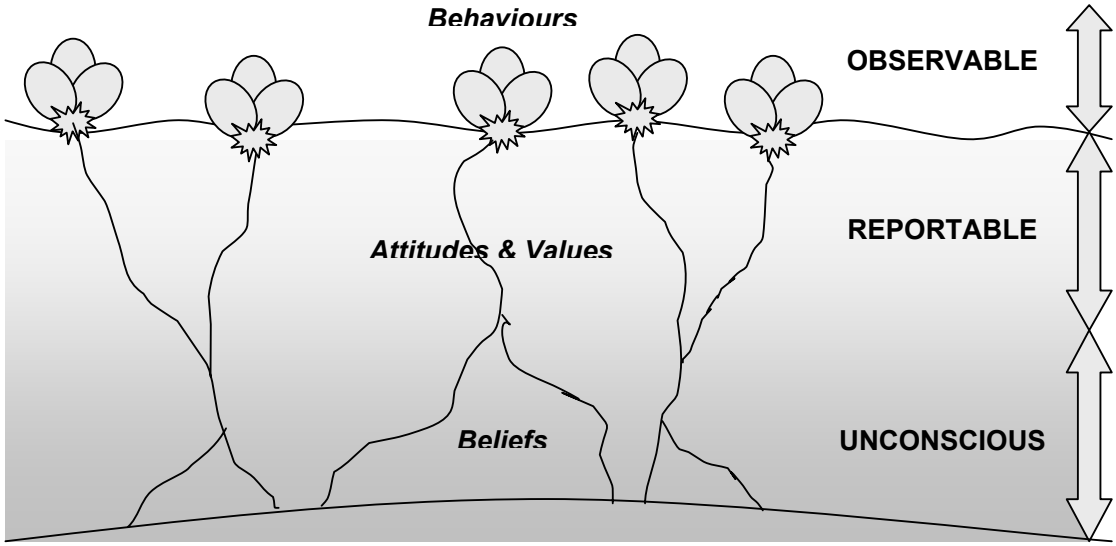
- Firstly, culture focuses on communication at all levels of the corporate hierarchy, where individuals identify who they are in relation to one another and the organisation, and where shared understandings form identifiable subgroups / sub-cultures.
- Secondly, by focusing on culture, one inevitably focuses on the daily routine and 'sense-making' that is the process of building identities and shared reality among organisation members.
- Thirdly, a cultural approach focuses on largely ignored issues such as assumptions and brings underlying values and motives to the surface.
- Fourthly, the understanding of culture offers a better insight to the managers and leaders of organisations – not in order for them to better shape the culture, but to better understand and participate in the 'sense-making' activities of organisation members.
- Fifthly, undertaking a cultural approach will help identify novel approaches and understandings of future organisations.
- Finally, culture is pervasive, not simply a variable that affects the organisation, but indistinguishable from the organisation (Pepper G. L. 1995).

The better understanding of culture "*thus helps generate insight into the organising activity that would be overlooked or presented differently in other approaches*"
(Pepper G. L. 1995) p29

3.2 Culture Defined

The word 'culture' stems from the word 'cultivate' (*the cultivation of soil*) (Webster 1956) – i.e.: the way in which people act on nature. In the case of humans, culture is "*a set of mores, values, attitudes, beliefs, and meanings that are shared by the members of a group or organisation*", and is often the primary way in which one 'group' (organisation, team, etc) differentiates itself from others (Williams A., Dobson P. et al. 1993; Duarte D. L. and Snyder N. T. 2001). The characteristic patterns of a group's behaviour and the elements of its culture can be portrayed using a diagram of a Lilly pond (Figure 3-1). In short, the diagram illustrates that the behaviour, attitudes, and values of members is dependent upon the sets of both conscious unconscious beliefs that individual members possess, and that these beliefs are seen as a 'key element' of organisational culture (Williams A., Dobson P. et al. 1993).

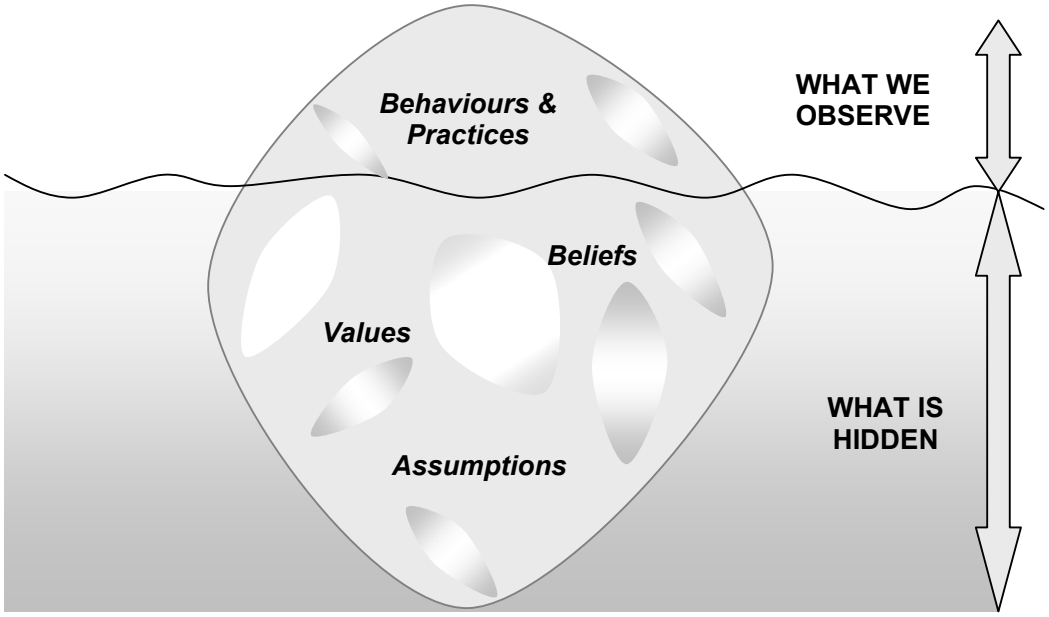
Figure 3-1: The 'Lilly Pond' of Culture and Behaviour



(Williams A., Dobson P. et al. 1993)

Another way of viewing culture is as the 'hidden scrips' created by repeated interactions between members of a group, which people use to guide their behaviours. These, over time, become 'invisible' and 'second nature', serving as 'shortcuts' for guiding actions and making decisions. (Duarte D. L. and Snyder N. T. 2001) best supports this definition of a partially hidden culture with a diagram representing an iceberg (Figure 3-2):

Figure 3-2: The Hidden Dimensions of the Culture Iceberg



(Duarte D. L. and Snyder N. T. 2001)

The following section provide a brief description of the various 'cultural terms' referred to in Figure 3-1 and Figure 3-2.

In summary, based on various literatures identified during this investigation, culture:

"*Begins to form wherever a group has enough common experience*" which inturn becomes the "*property of that group*"
(Schein E. H. 1999) p13.

"*Is influenced by traditions, myths, history and heritage*"..."*the sum of how we do things around here*"
(Hensey M. 2001) p49.

"*Pervades the decision-making and problem-solving process of the organisation, influencing the goals, means and manner of action*", and is "*a source of motivation and de-motivation, of satisfaction and dissatisfaction*", thereby "*underlining much of the human activity in an organisation*".
(Williams A., Dobson P. et al. 1993) p15

"Is a pattern of shared basic assumptions that has been learnt whilst solving problems, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems"
(Schein E. H. 1997) p12

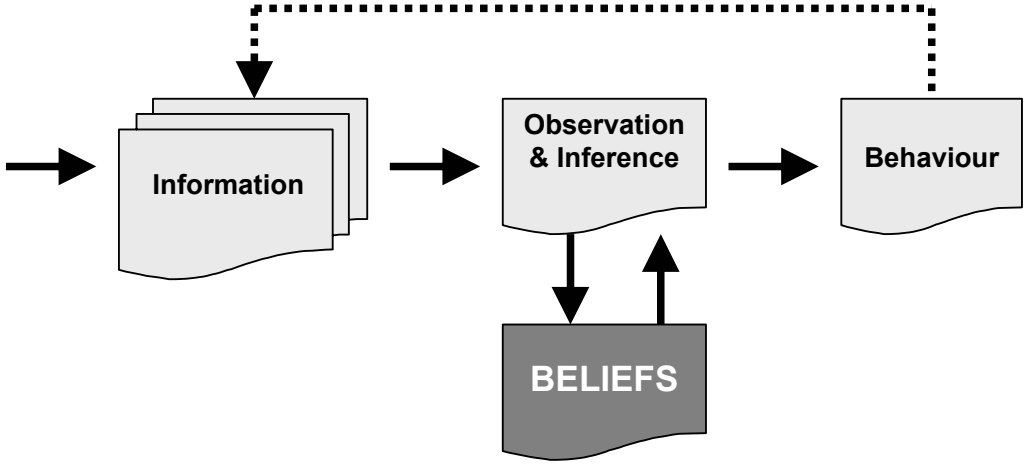
3.2.1 Beliefs

In its simplest form, refers to "*the information that an individual has about an object*" and its link to a certain attribute (Williams A., Dobson P. et al. 1993). The object of belief may be a person, a group, an institution, behaviour, policy, etc., and its associated attribute may be any object, trait, property, quality, quantity, characteristic, outcome or event. The use of the term 'belief' can (a) refer to the information or knowledge of an individual, (b) signify faith or trust, or (c) signify agreement. These beliefs are learnt –i.e.:

- gained by observation or experience;
- inferred from existing beliefs; or
- gained from external sources.

The formation and changing process of beliefs is based on information provided (Figure 3-3). However, if this information is unsupported by the direct experience of an individual, it highly unlikely to be accepted as a belief, unless the source is seen as highly credible or there is significant corroborating evidence.

Figure 3-3: Belief Formation



(Williams A., Dobson P. et al. 1993)

A wide range of different belief factors are identified which, in practice, can influence the development of the unique culture of an organisation (Williams A., Dobson P. et al. 1993). These include beliefs about:

- **The nature of the organisations environment:**
  - impact of legislation;
  - supplier capacity;
  - customer expectation;
  - competitor activity; and
  - stakeholder expectations.
- **Acceptable levels of organisational performance in terms of:**
  - asset growth;
  - return on investment;
  - productivity;
  - wastage and product quality;
  - market share; and
  - profitability.
- **The organisation appropriate for success:**
  - organisational structure;
  - reward and appraisal systems;
  - communication systems;
  - control systems; and
  - decentralisation of decision-making.
- **The organisation and its:**
  - philosophy;
  - identity;
  - importance;
  - role;
  - history; and
  - market leadership.
- **Ones own and that of others work behaviour:**

- work methods and roles;
- management style;
- formality;
- dress;
- cooperation;
- interpersonal relationships;
- productivity and quality;
- absenteeism and timekeeping.

Individuals existing beliefs directly and indirectly influence the development of future beliefs, which inturn, influences the information that they address and the kinds of conclusions they draw. Over time, resulting in the formation of a '*logically consistent network of beliefs*' – i.e.: *the belief system*, which in terms of the 'Lilly pond of culture and behaviour' (Figure 3-1), can be seen as '*providing the pond bed*' from which an individuals attitudes, values and actions stem from and grow (Williams A., Dobson P. et al. 1993).

3.2.2 Values

According to (Williams A., Dobson P. et al. 1993), the distension between attitudes and values is 'conceptually' unclear, yet in general terms, identifies two types of values:

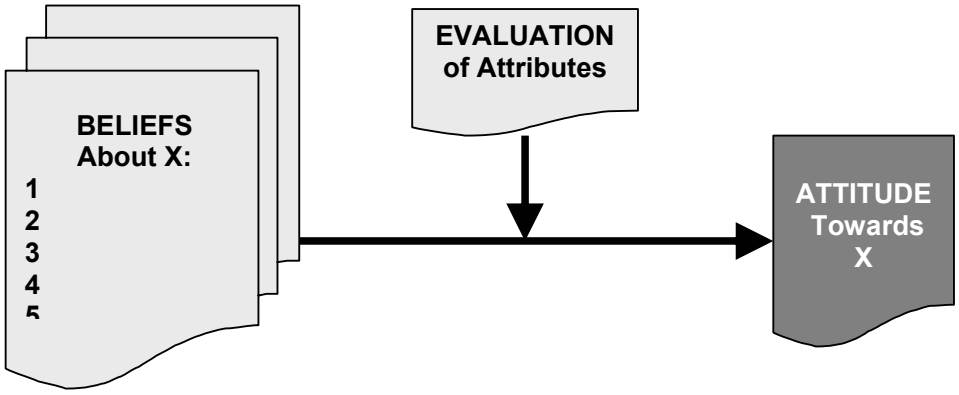
- *Instrumental*: values that result in feelings of satisfaction and dissatisfaction, reflecting desires or preferences that are virtually indistinguishable from attitudes; and
- *Moral*: Values that result in feelings of pride and joy by carrying a sense of obligation (should or aught) – i.e.: what is correct or proper.

Like attitudes, values are learnt - based upon the beliefs of an individual. However, unlike attitudes, values are 'cognitively evaluated', in terms of their logical consistency with existing beliefs.

3.2.3 Attitudes

Like beliefs, attitudes are learnt and dependent on experience. An attitude can be described as a "*learned predisposition to respond in a consistently favourable or unfavourable manner to a given object or idea*" (Williams A., Dobson P. et al. 1993). Most attitudes are developed over time, and involve an affective evaluation that prompts one to respond in a particular way. It is also worth noting that an attitude towards something is not necessarily based on 'direct' experience, and that individuals often hold a 'stereotype' attitude towards concepts such as management, business and technology, even without sufficient or complete information (Figure 3-4).

Figure 3-4: Belief and Attitude



(Williams A., Dobson P. et al. 1993)

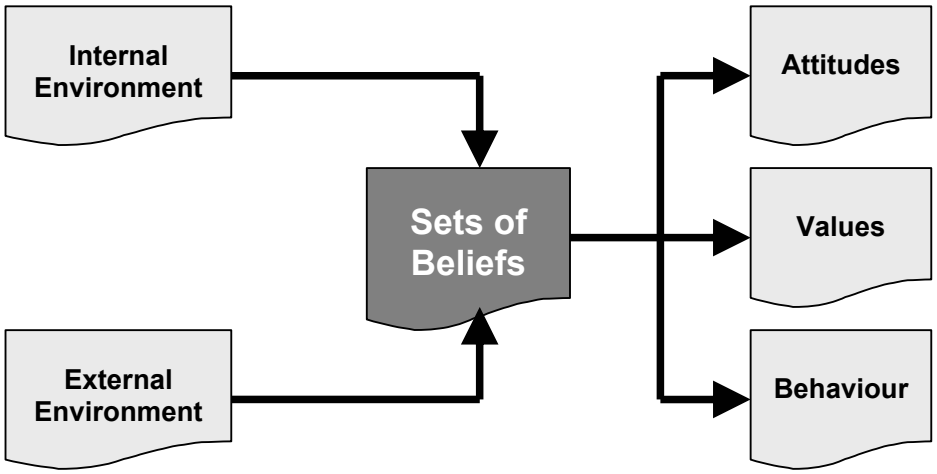
3.2.4 Assumptions

There are various types of assumptions shared, formed or taught within an organisation, for example those relating to industry, reality, truth, time and space. (Schein E. H. 1999), for example, defines culture as the sum total of all the shared and *taken-for-granted* assumptions that a group has learnt throughout its history. In basic terms, assumptions are strongly held by members of an organisation, and tend to be those realities or activities one neither confronts nor debates. Assumptions are difficult to change – e.g.: for an organisation and/or its members to learn something new (e.g. using a new ICT device or Internet-based process) requires them to *resurrect* and re-examine even the most basic assumptions pertaining to this change. This process of 'unlearning' or 'unfreezing' and then 'relearning' or 'refreezing' culture is discussed in detail in Section 4. This disruption temporarily destabilises their perceived and interpersonal surroundings, releasing a measure of basic anxiety, thereby resisting changing 'the way we do things around here', even if it means distorting, denying, projecting or falsifying the 'new truth' (Pepper G. L. 1995; Schein E. H. 1997).

3.2.5 Overall relationship

The relationship between the above beliefs, attitudes, values and behaviour is summarised in Figure 3-5 – i.e.: portraying culture as '*defined needs related to behaviour',* and thus related to that of organisational behaviour. Further illustrating that the attitudes, values and behaviours of members of an organisation are dependent on the '*sets of beliefs'* they possess, which inturn underlie their attitude, value and behaviour with respect to a specific person, action or object.

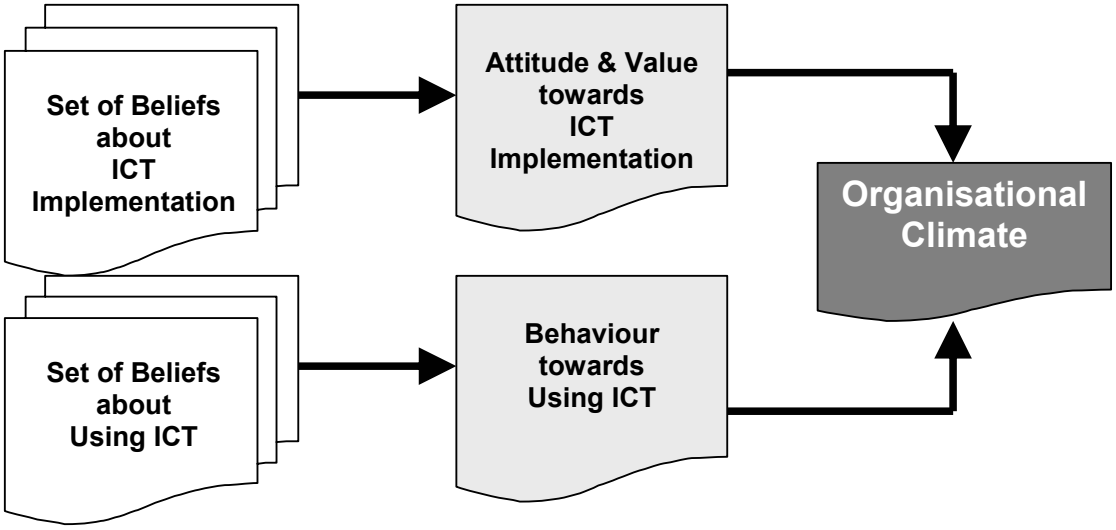
Figure 3-5: Relationship between Belief, Attitude, Values and Behaviour



(Williams A., Dobson P. et al. 1993)

Furthermore, as illustrated in Figure 3-6, when implementing, for example, a new ICT system or process, the 'climate' of an organisation is also influenced by the relationship between how members would like or aught to behave and what the work environment dictates that they do, in relation to that implementation.

Figure 3-6: Organisational Cultures and Climate



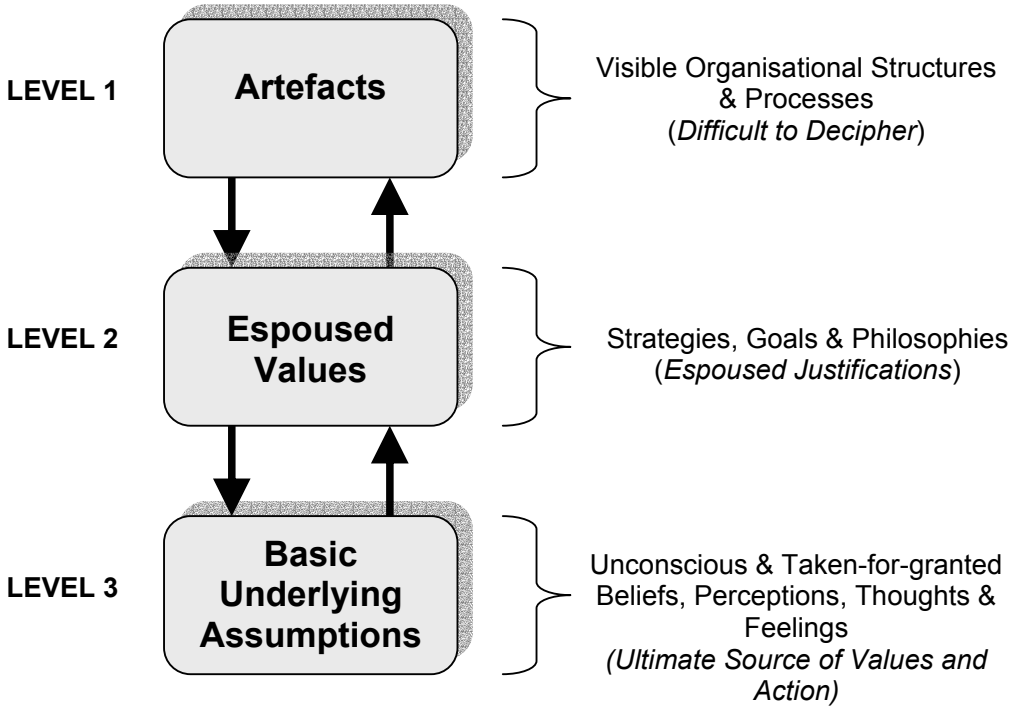
Adapted from (Williams A., Dobson P. et al. 1993)

Of course, employees or team members can be forced to comply to '*the new way of doing thing around here'*, but usually at a price. On the other hand, if their attitudes, values and behaviour are in harmony, then a stronger and more effective culture is likely to result, where members are committed to the overall change, goals and methods of the organisation, group or team (Williams A., Dobson P. et al. 1993).

3.3 Culture Levels

A common understanding of culture is by describing it as '*the way we do things around here*', yet Schein (Schein E. H. 1997; Schein E. H. 1999), believes culture can be better understood, observed, and analysed from three different levels. These three scales of the 'cultural phenomenon' range from the highly tangible (that one can see and feel), to the more deeply embedded, tacit and unconscious assumptions (Figure 3-7).

Figure 3-7: Three Levels of Culture



Adapted from (Schein E. H. 1997; Schein E. H. 1999)

In order to observe, analyse and understand culture seriously within an organisation, group or team, one need to appreciate the depth and power of culture fully (Schein E. H. 1999). Therefore, whilst these three, seemingly basic, scales or levels of culture are very useful in trying to better understand culture, one should not assume these describe the whole of culture, or that they would be the same in every organisation, group or team (Schein E. H. 1997). Culture is significantly '*deeper',* a lot more '*extensive'* and exceedingly *'complex'* (Schein E. H. 1999):

- **Level 1 – Artefacts:** Described as being the 'easiest' level to observe – i.e.: what one sees, hears and feels. For example, when walking into an organisation one immediately can sense organisations are unique in the way 'they do things' – i.e.: open plan office vs. closed door offices; employees talking freely with each other vs. a hushed environment; formal vs. informal dress; etc. Yet, one needs to be careful in basing ones likes and dislikes or the success and failure of an organisation on only these, because at this stage of the observation it is not clear as to why organisations present themselves and dealings with each other in a particular way.
- **Level 2 – Espoused Values:** To better understand and to help decipher why the initial observations in Level 1 are taking place, one needs to ask 'insiders' of the organisation to try

and explain. What happens when, for example, two similar organisations are identified as having very similar documented and publicised company values, principles, ethics and visions that their employees believe and abide by – i.e.: described as their culture and reflecting their basic values - yet, the two organisations have very different physical layouts and working styles, even with similar espoused values? To help decipher these 'inconsistencies' one must understand that "*a deeper level of thought and perception is driving the overt behaviour*".

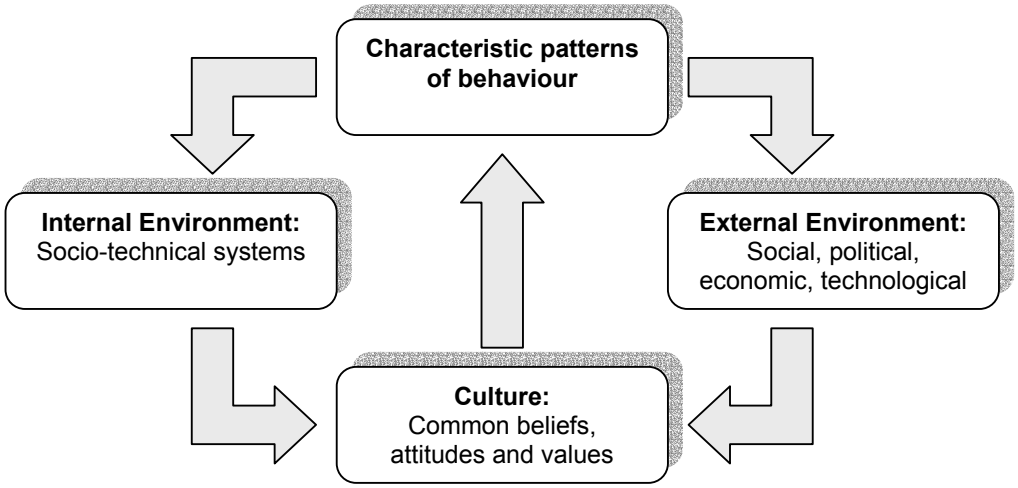
- **Level 3 – Shared Tacit Assumptions:** To help understand this 'deeper' level of culture, one needs to investigate the history of an organisation – i.e.: what were the initial values, beliefs and assumptions of the founders and key leaders of an organisation that made it successful? Over time, these became shared and taken for granted when new members of the organisation realise that the initial values, beliefs and assumptions of their founders led to organisational success – i.e.: through jointly learning / adopting the 'right' values, beliefs and assumptions.

3.4 Characteristics of Organisational Culture

Based on the above definitions, organisational culture has the following key characteristics:

- **Culture is learnt:** Beliefs, attitudes and values are gained from the individual's common 'internal' and 'external' environment (Figure 3-8).
  - *Internal environment*: comprises the social and technical (socio-technical) systems of the organisation – i.e.: the decision-making, planning and control procedures of the organisation and its technology.
  - *External environment*: where the organisation is embedded in social, political, legislative, economic and technological systems. Organisations working in different sectors of the industry have different markets, technologies and legal constraints, with different skill and resource requirements.
- **Culture is both an input and an output:** organisational culture is both the result of action and a conditioning element of future action, influenced by the socio-technical systems of the organisation, which are inturn influenced by the common beliefs, attitudes and values of its members (Figure 3-8). Therefore, due to culture being both an input and an output, it is likely to be highly resistant to change.

Figure 3-8: Culture as an Input and an Output



(Williams A., Dobson P. et al. 1993)

- **Culture is partly unconscious:** Firstly, members of an organisation may unconsciously (below the threshold of awareness) process information that can influence behaviour – e.g. via subliminal advertising or the 'aha' fashion of suddenly finding a solution to a problem. Secondly, the conscious beliefs, attitudes and values that underline behaviour may repeatedly lead to success, to the extent that they end up taken for granted - slowly fading from ones awareness.
- **Culture is historically based:** Organisations are developed from the original assumptions, strategies and structures made by their founders, limiting the degrees of freedom for succeeding generations – i.e.: the 'original' culture influences successive generations because decisions affecting the nature of the organisation are made 'within' the context of the existing culture. Assumptions are also developing during the history of an organisation. The decision for an organisation to enter a new market or process (e.g. via innovative ICT or Internet solutions) will initially be fiercely debated and resisted, but when it leads to success, the issue will drop from awareness and eventually be accepted as a natural part of the business.
- **Culture is commonly held rather than shared:** Commonly held beliefs, attitudes and values are mostly not shared, but 'derived at' through reaching a 'consensus' on how to think and behave in a given situation within the organisation. Usually, individuals within a given culture have not had the opportunity to discuss or agree on how to think and behave, yet tend to 'reflexively' assume similar ways of thinking or behaving; adopt comparable interpersonal styles, rituals and modes to dress; and know immediately who has authority over whom and what, even if they may be geographically or functionally separated.

  In addition to the above beliefs attitudes, attitudes and values unique to the individual members of an organisation, the organisational culture itself comprises of the beliefs, attitudes and values uniquely common to the:
  - Work group
  - Department, function or unit
  - Society or parts of society from which members are drawn

  These three 'cultural components' are relatively important and will vary from one organisation to another, for example:
  - If the organisation operates through a series of 'highly autonomous' divisions, it is likely that the beliefs, attitudes and values of the division (department, function or unit) will be paramount.
  - If the organisation makes extensive use of teamwork, then the contributing work group is likely to be important.
  - If the organisation or its team draws the majority of its members from a restricted geographical region, then it is highly likely that the culture of that specific society will play a significant role.

- **Culture is heterogeneous:** That is, in reality, organisational culture is unlikely to be entirely homogeneous. Most are characterised by a number of sub-cultures that form around different roles, functions and levels of an organisation's members. Sub-

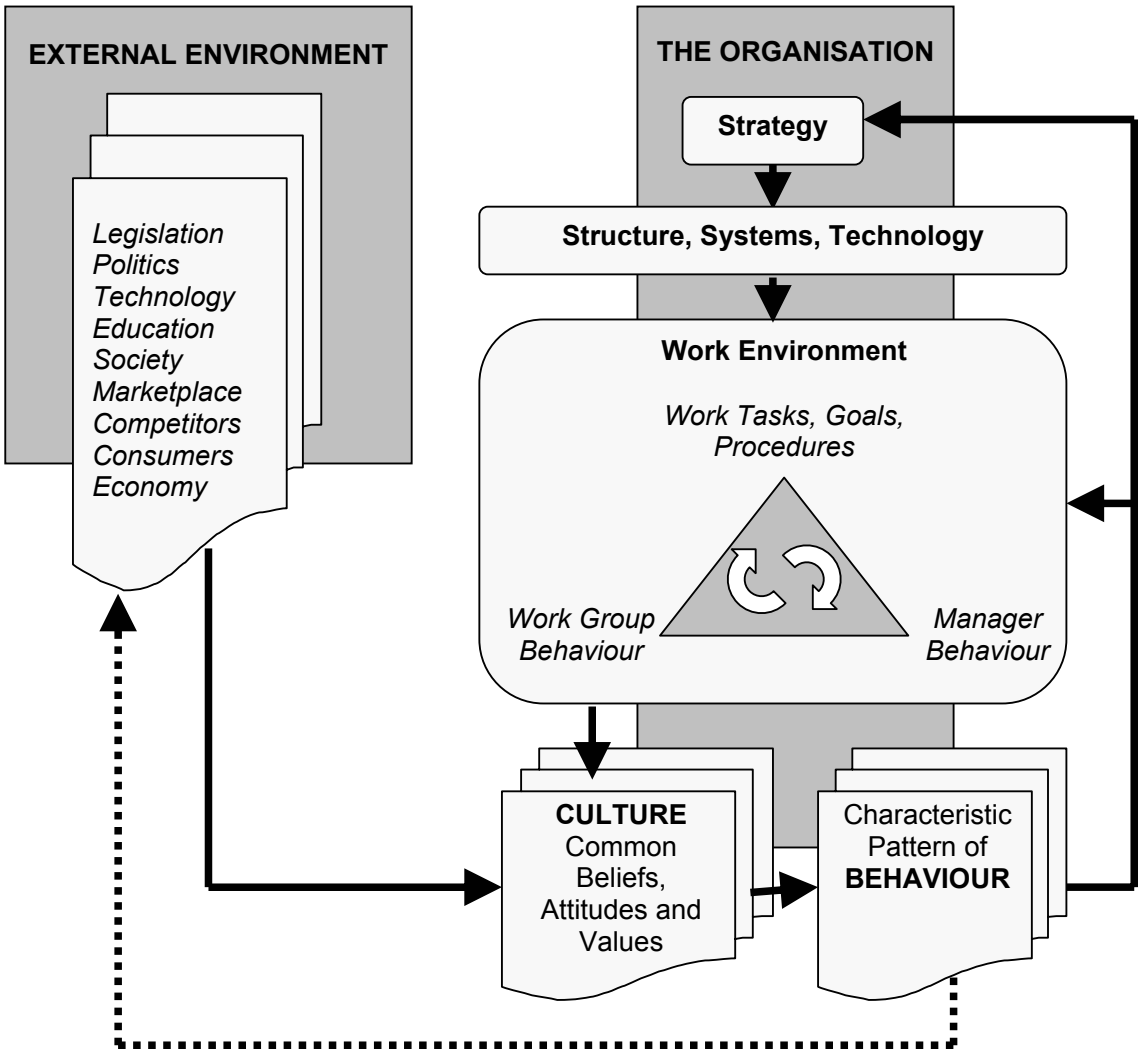
These various characteristics of an organisation, group or team are what seem to give culture its '*slightly mystical quality'* (Williams A., Dobson P. et al. 1993).

3.5 Determinants of Organisational Culture

Based on the above literature, the common beliefs and attitudes of members in an organisation, group or team result from a common environment, experience, and history, formed through

observation, interaction and communication. Yet, how does the culture of one organisation, group or team differ from that of another, and what factors determine which beliefs, attitudes and values are common to their members? (Williams A., Dobson P. et al. 1993) responds by referring to the characteristics of organisational culture (Section 3.4), where culture results directly from the external environment, the structures, the systems and technology of the organisation, and from the founder, manager and work group. It is in all these 'sources' that common beliefs, attitudes and values originate from – i.e.: the major determinants of culture (Figure 3-9).

Figure 3-9: Determinants of Organisational Culture



Adapted from (Williams A., Dobson P. et al. 1993)

3.6 Culture Classifications

Brief descriptions of three culture classifications (sub, industry and ICT) are presented in the following sections. An additional six 'common' culture groups, types, tribes, etc., found in today's organisations, can be viewed in Appendix II.

3.6.1 Sub-cultures

The ‘culture’ of an organisation, group or team is not something it ‘has’, rather it is something it ‘is’, and in many cases mistaken as being ‘unified and singular’. The reason for perceiving the culture of an organisation as being ‘primary’ or ‘dominant’, is based on one overlooking the fact that organisations, groups or teams are actually composed of many, often competing, sub-cultures. The development of these sub-cultures is a natural development, formed within any group of people who regularly interact within the workplace, based on shared understandings and interpretations of events among its members (Pepper G. L. 1995).

Attempting to analyse and better understand the culture of an organisation, group or team can be challenging, because although the overall organisation has a shared mission and strategic intent, its sub-cultures, developed within the ‘overall’ culture of the organisation, may organise themselves differently in their efforts to achieve it (Schein E. H. 1999). For instance, if the beliefs, attitudes and values of the ‘founder’ of an organisation are well adapted to the environmental realities the organisation faces, it will generally grow and age confidently. With this, a first set of strong sub-units/cultures arise (based on function, geography, markets, or products) that have to survive in their various environments. In adapting to these environments, their own set of beliefs, attitudes, and values evolve, which are usually congruent with, yet different from, the core beliefs, attitudes and values of the ‘founder’ of an organisation. These sub-cultures are sometime also referred to ‘silos’ or ‘stovepipes’, where members build invisible boundaries around themselves, making it harder to communicate across them and/or to integrate their various efforts.

A second type of sub-culture that forms during the ‘growing and aging’ process of an organisation is those of employees and managers (at a given level within the organisation) who tend to share common experiences. These common experiences become the basis for their own, mutually held beliefs, attitudes and values of ‘how things are or should be done around here’. Needless to say, the shared beliefs, attitudes and values of these sub-cultures, again differ from each other, for example:

- *Employees / staff groups:* such as engineering, finance, planning, etc. may base theirs on their professional and occupational backgrounds.
- *Supervisors:* may base theirs on the nature of their jobs.
- *Middle managers:* may base theirs on the similarity of their roles.
- *Executive management:* and the people they take into their confidence, may base theirs on the financial and overall direction of the organisation (Schein E. H. 1999).

Supporting the above, (Williams A., Dobson P. et al. 1993) describes an organisation’s culture as ‘heterogeneous’, characterised by the various sub-cultures, which are formed around roles, functions and levels within the organisation. These vary from department to department according to the level of hierarchy. Further stating there can be many sub-cultures within any given organisation, and typically comprising of at least three:

- *Executive:* Members with a common perspective and belief about the strategic direction of the organisation
- *Management:* Members of the organisation who focus on managing and resources
- *Blue Collar:* Focusing mainly on the production or service end of the organisation

Due to the nature of these sub-cultures, very few of the beliefs, attitudes and values are common to all their members. These differences can be beneficial, for example, if they increase a sense of common purpose and identity within a given department. Then again, they can be highly detrimental to the overall success and strategic direction of the organisation if they limit

coordination and cooperation, or cause conflict between its departments and occupational levels.

Therefore, what makes these sub-cultures unique is the fact that they can be completely congruent; supportive of each other; in opposition to each other; and/or independent of each other (Schein E. H. 1997). The degree to which these functional, geographic, market, product, and occupational sub-cultures are aligned with each other, is a 'major determinant' of how well the organisation as a whole functions (Schein E. H. 1999).

3.6.2 Construction industry culture

In his speech to Cornell University School of Civil and Environmental Engineering, Michel describes the American (and possibly overall) construction industry as an integral part of any country's business environment with three basic types of 'personalities' – i.e.: three industry cultures (Table 3-1).

Table 3-1: Construction Industry 'Personalities'

CONSTRUCTION INDUSTRY	
CULTURE TYPE	**PERSONALITY**
Undertakers	: simply leave everything alone - '*uninspired mourners*' of the past
Caretakers	: just flow with the tide and only take care of things that supports their immediate environment – '*if it ain't broke don't fix it*'
Risk takers (innovators)	: the only ones who promote new technologies, new communication tools and who take on new challenges head on. Contradictory to the 'caretakers' of the industry, risk takers '*will fix it even if it ain't broke*'.

(Michel H.L. 1998)

Further stating that the construction industry's 'problems' lie with all its participants, not just the '*hard hats*', and that they can be overcome if industry participants simply learn to trust each other. Due to the growing lack of trust, the industry has become overly protective and overregulated, moving it further and further away from being 'risk takers' to being 'caretakers' – i.e.: trust has been replaced by litigation. The three industry 'personalities' (cultures) is best described by the following tale

"*Three men are doing the same task on a construction site. When asking them what their task was, the first replied 'breaking rocks', the second 'earning a living' and the third 'helping to build a cathedral'*
(Michel H.L. 1998).

To ensure a successful and effective project team, it needs to be embraced by its members as a 'total discipline' – i.e.: applied constantly; during formal and informal discussions; in times of project related (as well as personal) crisis; and any other everyday interactions (Hiley M. 2001). Hence, the industry is advised to develop an 'indisputable code of ethics' that emphasises integrity and trust in all its activities, thereby encouraging an increase in its participants to '*help build cathedrals*' rather than continue to simply '*break rocks*' (Michel H.L. 1998).

3.6.3 ICT culture

There are various levels of interactions and transactions taking place within any given organisation, and although its culture mainly involves human interactions and transactions, we must remember that humans use technology, upon which they often become dependent on and all too easily overlook (Pepper G. L. 1995). 'Technology', in this case, includes any form of mediated communication via any ICT device and the Internet. The use of each form of communication medium has an impact on traditional human communications, for example:

- How technology affects face-to-face interactions when using, for example, Web-based video conference facilities
- How the introduction of technology affect overall workplace climate – traditional vs. electronic 'way of doing things'
- How access to technology 'democratises' the workplace by making information more available to more people
- How 'electronically mediated' communication affects decision-making

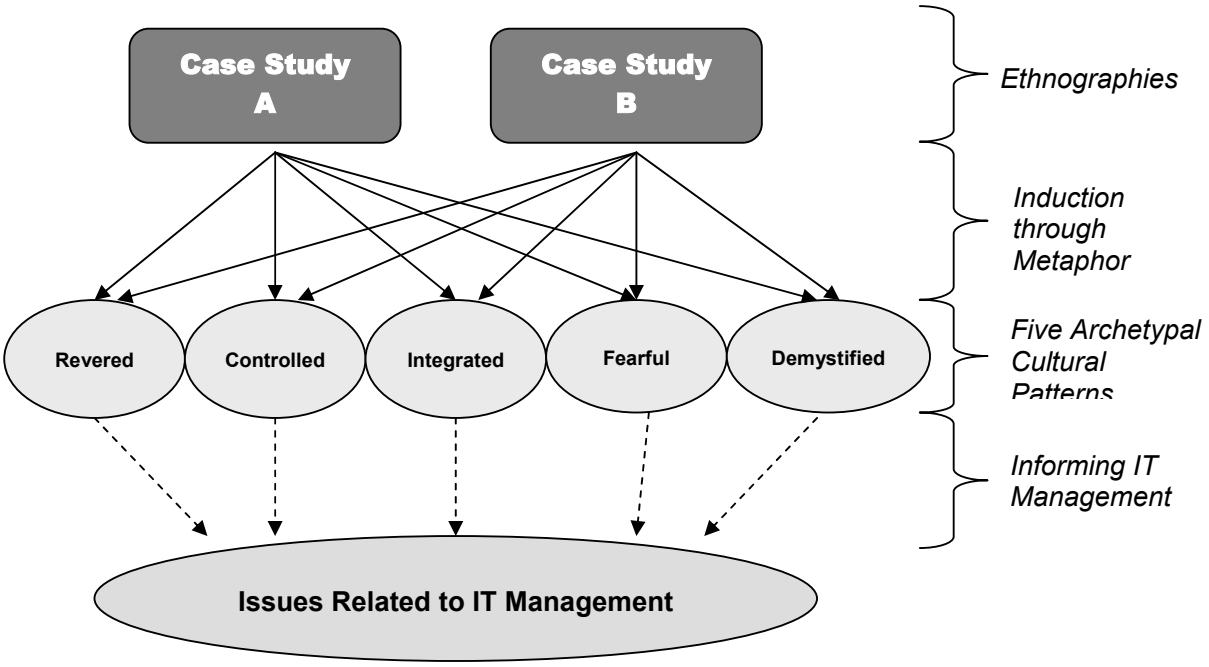
Studying two large (non-construction) organisations (ethnographies) and their staff's historical relationships, experiences and interpretations of ICT, and by employing metaphors – i.e.: '*magic dragons*' (representing ICT), and '*wizards*' (representing ICT specialists) - enabled (Kaarst-Brown M.L. and Robey D. 1999) to identify five archetypes of ICT culture. Although this research was undertaken within two large USA insurance organisations, it is suggested construction industry participants channel its findings, lessons and recommendations, and apply them to current and future ICT implementation ventures.

Whilst the use of metaphors is regarded by some as 'never quite accurate', they are still accepted as an alternate, yet useful way to describe organisational cultures (Line M.B. 1999). The 'interpretation' of ICT cultures as a form of '*twentieth century magic*' and believed to:

- lend insight into the variety of ways in which ICT is managed within organisations and their cultures; and
- reveal some of the dilemmas associated with successfully integrating ICT with business needs.

Figure 3-10 provides an overview of the strategy researchers used for analysing the data (pertaining to management and implications of ICT) from the two case study organisations.

Figure 3-10: Strategy for Developing Five ICT Cultures

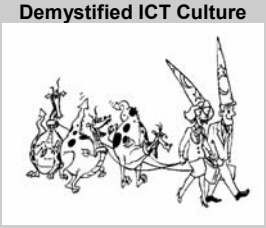


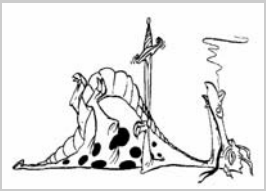
(Kaarst-Brown M.L. and Robey D. 1999)

Importantly, the elements of each archetype culture were developed from both organisations – i.e.: neither organisation was associated with only one culture (Table 3-2).

Table 3-2: Five ICT Cultures

FIVE ICT CULTURES		
METAPHOR	**DESCRIPTION**	**IMPLICATIONS**
Revered ICT Culture  *'Dragon on a pile of gold'*	• ICT has significant positive impacts for the organisation • Honours those responsible for introducing ICT (does not criticise technology) • Innovation and championship behaviours are encouraged to support continual improvement through creative, effective use of ICT • ICT knowledge, skills and resources belong in the hands of those who understand them • Able to overcome gender bias (technology skills is the key to prosperity and promotion)	• ICT innovations experience little resistance • Early ICT adopter stand to gain competitively by applying it to their business needs • organisation becomes compliant with its ICT 'superiority' - getting blindsided in a crisis (not support emerging business needs) • conflict between those who understand ICT and requirements for successful implementation and those who make the decisions • ICT 'wizards' disregarding user dissatisfaction and frustration

FIVE ICT CULTURES (cont.)		
METAPHOR	**DESCRIPTION**	**IMPLICATIONS**
Controlled ICT Culture  *'Caged dragon'*	• Neither 'dragon' (ICT) nor 'wizard' (ICT specialist) are trusted enough to be 'freed' and their 'magic' (abilities) are to guarded and controlled • Senior management (centralised) control with minimal interaction with lower level end users • ICT specialists are deprived (caged) members of the organisation – minimally involved in strategic directions as they are perceived by senior management as not having the necessary 'business knowledge' to understand strategic application of ICT, therefore receive and control few resources • ICT perceived as a 'necessary evil'	• Found to allow better integration of ICT and business strategies • Intensified competition resources between management and ICT specialists – 'whoever yells the loudest wins' • Lack of senior management ICT knowledge and skill effects innovative decision making – ICT aloud limited opportunities to influence strategic planning • Fail to develop adequate ICT skills • Senior management (usually older) tend to smother the (perceived threatening) ICT creativity of younger managers
Demystified ICT Culture  *'Pet dragon'*	• Inexperienced ICT specialists are unaware or unappreciative and only partially in control of ICT capabilities or opportunities • realising their own employment future depends on it, business employees are more aware of what ICT has to offer and develop / implement themselves - without accessing ICT resources ('self proclaimed wizards')	• ICT identification and application opportunities (and risks) realised through recruitment of employees that are 'self sufficient', 'independent' and 'self proclaimed' ICT 'wizards' and users • Discouraged reliance on ICT specialists • users solve their own ICT problems • tension between fragmented / duplicated ICT efforts of users and ICT management
Integrated ICT Culture  *'Team Dragons'*	• ICT, the specialists and users place equal value on each other's skill and capabilities (independently competent yet reliant on each other) – creating a positive and creative experience shared by all. • Business goals and client needs drive ICT innovation • Not widely supported	• due to ICT users and specialists willingly working together, ICT solutions to business problems can be positive achieved • teams do not necessarily function well simply because they were formed – e.g.: an innovative ICT is developed by specialists but poorly implemented by management / potential end-users • hard to sustain commitment is required • hidden agendas and problem solving rituals will cause the teamwork concept to fail.

Fearful ICT Culture
 
'Dead dragon'
	• rely on manual information processing (even if ICT is available and proven capable)
	• resist / mistrust ICT (automation) based on various rationales:
	  • inability to replace human intuition;
	  • inaccuracy of tool/ system processing;
	  • difficulty to correct tool / system errors; and
	  • mistrust of developers
	  • fear
	  • lack of knowledge, experience and skills
	  • introduce unnecessary risk
		• ICT mistrust may emphasise a greater concern for people – placing an innovative ICT under close scrutiny
		• Tend to continue manually until all ICT flaws are detected, corrected and potential benefits were realised by all
		• Transition from manual to automated to be gradual and 'as easy as possible for employees
		• Invest significant resources in training
		• Continued fear of an implemented ICT system limits further innovation and leads to under-utilisation

3.7 Summary

Culture is one of the most difficult and complex approaches to understand. This is mainly due to culture being defined in so many different and sometimes conflicting ways (Pepper G. L. 1995).

Described as influencing and influenced by various issues, ranging from major strategic decisions down to the layout of the offices or the way members of an organisation, group or team address one another (Williams A., Dobson P. et al. 1993). Care must be taken, though, when attempting to 'brand' an organisation, group or team as simply having either a 'strong' or 'weak' culture – i.e.: is it a strong culture because its central beliefs and attitudes are strongly held; or because they are common to all groups (homogeneous); or because it promotes overall effectiveness?

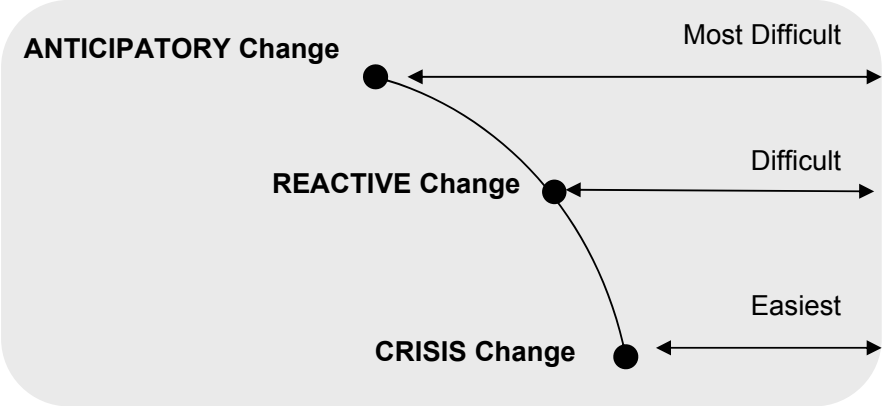
In (Bate P. 1996), for example, a 'strong' culture is described as having employees with increased authority and responsibility, who can be relied on to set their own standards and discipline, and where this 'freedom' is conditional upon the ability to 'deliver'. According to (Williams A., Dobson P. et al. 1993), the strength of an organisation's culture is defined as the extent to which the members have 'internalised' the beliefs, attitudes and values that exist within the organisation – i.e.: whereby individuals undergo a 'reasoning process' to mutually accept, agree with, own and value the beliefs, attitudes and values of other members. Further stating strong cultures are characterised by *"dedication, spontaneity and cooperation in the service of common values*" that can operate in direct conflict with the goals of senior management and other sub-cultures. That a strong culture is unlikely to be 'imposed', but rather 'fashioned' through the availability of valid information, openness, trust and free choice. The internalised beliefs, attitudes and behaviours of a 'strong' organisational culture is less likely to change, but in the case of a 'weak' organisational culture, changes in policies, rewards, tasks and structures are likely to "*modify organisational behaviour and cause a cultural shift*".

"When we know what culture is, we know what needs to be changed for culture to change. Only once we appreciate its nature can we understand how it might be changed. When we know its role, we can comprehend its importance"
(Williams A., Dobson P. et al. 1993) p11

4 CHANGE

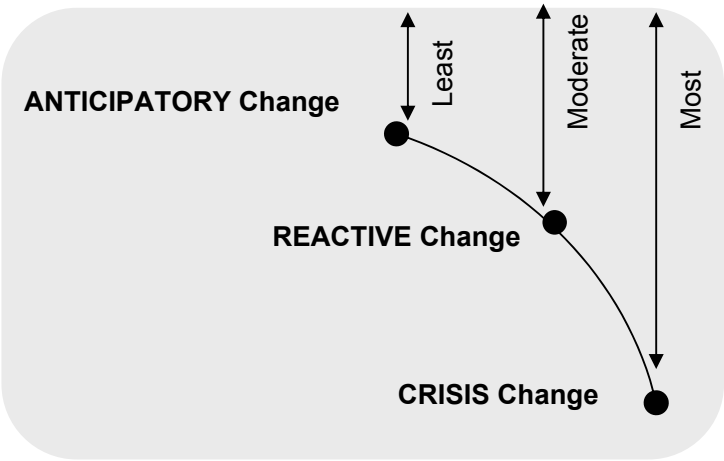
The timing of implementing a change process or method in an organisation could determine the success or failure of that change. To follow, three 'tactics' to help determine a more 'timely' (Figure 4-1) and cost effective (Figure 4-2) implementation of a change, as identified in (Black J. S. and Gregersen H. B. 2002).

Figure 4-1: Difficulty of Change



Adapted from (Black J. S. and Gregersen H. B. 2002)

Figure 4-2: Cost of Change



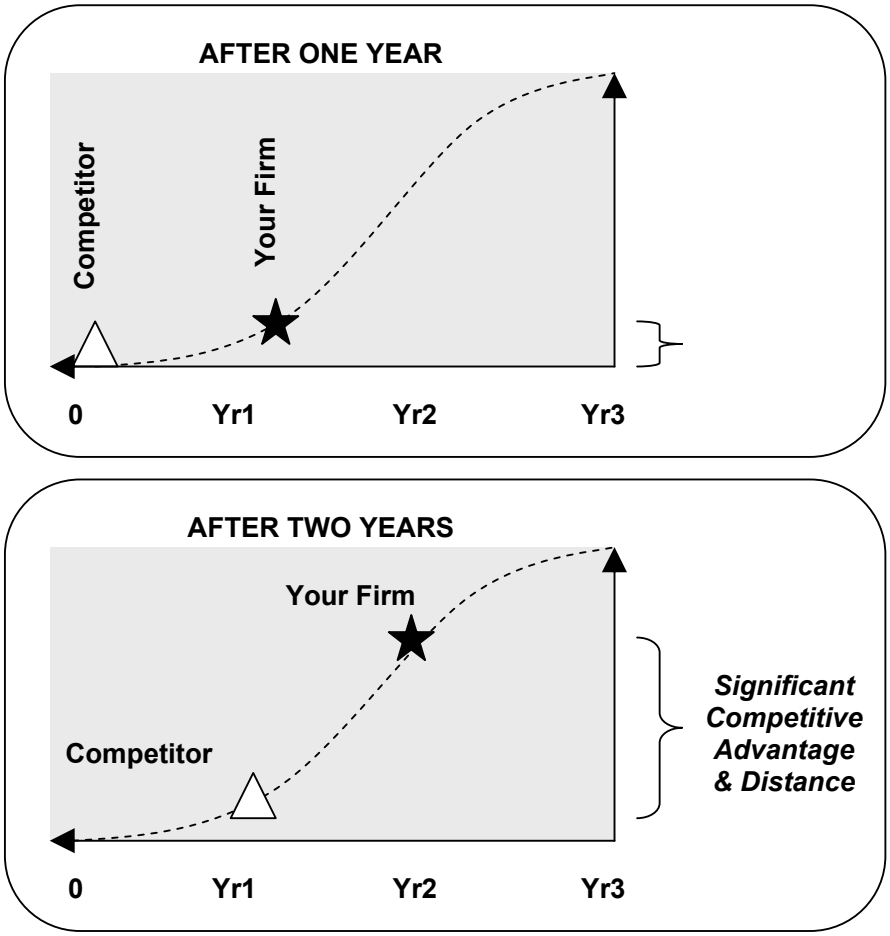
Adapted from (Black J. S. and Gregersen H. B. 2002)

Referring to (Figure 4-1) and (Figure 4-2), a brief description of each of the three change tactics:

- **Anticipatory Change:** When organisations look ahead and predict change in advance – i.e.: anticipating the need for change. This is the most difficult of the three approaches start and finish due to difficulty in sensing future threats and opportunities or what unpredictable course they may take. Unknown return on investments is also a major reason why executives avoid this process. However, if executed correctly, this change tactic can present the greatest potential benefits and lowest cost to a firm, and when change involves steep

and ongoing learning, then the sooner a firm starts changing, the greater will be the firm's advantage over slower-to-change competitors (Figure 4-3).

Figure 4-3: Competitive Advantage



Adapted from (Black J. S. and Gregersen H. B. 2002)

- **Reactive Change:** When organisations react to the obvious signs and signals that change is needed – i.e.: by observing customers, competitors, shareholders, employees, etc. This seems to be the most common approach. It is slightly easier to get underway than the 'Anticipatory' change and less costly than the 'Crisis' change (below), due to a more certain change opportunity being identified before the organisation's 'survival' is a critical factor in decision-making. Organisations with a reasonable 'agility' to change at short notice can benefit greatly by responding to change as a 'quick second mover' rather than a 'slow first mover'.
- **Crisis Change:** When signs and signals to change have multiplied and intensified to the point where the organisation no longer can deny them – i.e.: where the need or opportunity for change has been ignored for too long, and where competitors have already begun to change. The longer an organisation ignores this need or opportunity for change, the less chance of survival and competitive edge. Although this type of change is the easiest, it usually costs money, shareholder value, customer value, and jobs.

4.1 Culture Driven Change

"*If you do not see a truck racing towards you, you are unlikely to jump out of the way. Likewise, if you do not realise that you are standing on a treasure of gold, you are unlikely to bend down and pick it up"*.
(Black J. S. and Gregersen H. B. 2002) p20

4.1.1 Need for culture change

The above statement reinforces the importance for organisations, groups and teams to realise and create a 'need' for change, before the act of change can take place. Unfortunately, for people to be convinced of the need for change is, according to (Black J. S. and Gregersen H. B. 2002) easier said than done, because people tend not to see even the most obvious threats and opportunities because they are 'blinded' by the '*way we have always done things around here*'.

Many organisations decide to change their existing culture based on the need to implement a strategic change (strategy driven), due to a certain 'crises' or 'opportunity' being identified – i.e.: many organisations are driven to change due to business demands, not necessarily by the need to change culture. Yet, this change strategy requires a change in organisational objectives, work methods, habits, systems, structures, training, and the way people '*think or do things around here*' (i.e. culture). The successful change in culture can promote a strategic change, but if not properly implemented and managed, both existing and 'enforced' culture groups may constrain a new business strategy (Williams A., Dobson P. et al. 1993; Bate P. 1996; Schein E. H. 1999).

If people fail to see the need for change (whether threat or opportunity driving it), they will not change"
(Black J. S. and Gregersen H. B. 2002) p20

4.1.2 Methods of culture change

Changing the culture of an organisation and its members takes time. It is a slow process for people in existing or newly established 'social systems' to develop commonly held beliefs, attitudes and values (Williams A., Dobson P. et al. 1993). Today's industry organisations are using a wide variety of mechanisms in an attempt to change their culture. The identification of the above 'crisis' and 'opportunity' factors, for example, are echoed in (Whyte J. 2002), stating there are two major methods to create the need for change. The first method to motivate people to change is when they are confronted with a real or perceived threat (e.g. job security, increasing competition, etc), which inturn motivate short-term behaviours. The second method is through real or perceived opportunities (e.g. improved profitability, greater productivity, increased employee development, etc), which inturn motivate long-term behaviour within an organisation. It is also important to note that real or perceived threats and opportunities will vary from organisation to organisation, where certain key threats and opportunities are better or worse for one but not the other.

An alternative mechanism in an attempt to change culture is that by (Williams A., Dobson P. et al. 1993), who investigated a number of case study organisations, and identified six key methods of changing the culture of an organisation, namely by:

- **Changing People:** By changing people, particularly those in key positions or with more uncompromising attitudes, one may change the pattern of beliefs and attitudes within the organisation – i.e.: promote cultural change. In this case, recruitment, selection and

redundancy are frequently part of the change process, but because employee commitment and positive culture is recognised as being essential to the long-term survival of a company, it is suggested to do this only once – i.e.: make one 'large cut' rather than a series of small ones.

- **Changing Places:** As highlighted in earlier sections of this report, sub-cultures within an organisation develop around differences in functions, roles, and levels of its members. Therefore, in order to promote the existing overall culture of an organisation, one can 'reshuffle' or 'rotate' groups and/or individuals, with different knowledge, experiences and learning, and move them into key positions within other sub-cultures. For example, certain key personnel (managers, project leaders, etc.) who have been in a certain position for a certain period were, as per their agreement, moved to another section, department or branch. Interestingly, in the majority of these cases, there were marked improvements in performance, in not only the section, department or branch they were moved to, but also the one they left behind.
- **Changing People's Beliefs and Attitudes:** Due to beliefs of individuals directly being influenced by or formed through observation, interaction, participation, and persuasive communication (Section 3.2), several case study organisations used one or more of the following methods for changing the beliefs, attitudes and values of their employees:
  - *Through use of role models*: By recognising the importance of senior / key individuals, acting as role models to achieve the desired attitudes and behaviours of employees – i.e.: simply through observation, people are likely to imitate those behaviours that they believe are likely to lead to success.
  - *Through participation*: Formalised group discussions, such as morning meetings, team briefings, etc., are alternate methods for developing shared beliefs and attitudes. As part of the cultural change process several organisations found formalised discussions, when held in an appropriate climate, increased the involvement of employees – i.e.: by encouraging identification and commitment to a team, task or organisation; improving organisational communication and control; requiring group experience in problem solving; and promoting participative management practice.
  - *Through use of formal communication*: Although a common process, it can be used more extensively and effectively to 'communicate' the organisation's culture to their employees and local community from which they recruit the majority of their employees. This can be done through in-house or external corporate advertising media groups, for example, and publishing articles entitled '*Protecting Customer Investment*'; '*Putting the Customer First'*; or '*Responding to Change Demands*'.
  - *Through counselling*: When, for example, there is a need for an organisation to make significant reductions in staff in order to cut costs and improve its profitability, it is difficult to promote a proactive and positive culture at the same time. Therefore, once the process of informing management is complete, and there is complete commitment to the change from the most senior level, it is suggested each level of management carries out one-to-one interviews with their employees. This should take place before any changes are made or publicly announced, explaining in detail the intended changes and implications for the individual concerned; and defining what would be expected of those working in the 'new' organisation.
  - *Through Management education*: Educating management is a central strategy for many organisations to achieve a cultural change. Where, for example, the top two or three levels of management are sent on externally run courses, and where external consultants are then brought in to advise and run a 'customised' internal program to help 'cascade' this newly acquired knowledge and management process down to the rest of the staff.

Interestingly, the majority of the case study organisations did not have culture change as their main objective. The method of change was initially to implement a new strategy, but by introducing new company policies and objectives – i.e.: though the use of one or more of the above methods - inturn also changed people's beliefs and attitudes and thus the culture of the organisation.

- **Changing Behaviour:** Changing culture is a matter of changing values and attitudes, rather than teaching people new techniques or replacing old procedures or processes with new ones. However, research indicates that training new skills is likely to change people's beliefs and attitudes towards, for example, their capabilities in producing a new product or outcome.
- **Changing Structures, Systems and Technology:** Changing the structure of an organisation will usually make some, and rather unpredictable, impact on its culture – i.e.: influencing existing work groups and communication networks. However, through revised or improved reward, appraisal, monitoring, budgeting and control systems, which are said to be linked to specific behaviours, are therefore, largely more capable of changing people's beliefs and attitudes towards performing in particular ways.
- **The Corporate Image:** By developing a corporate image (via name, logo, advertising, publication of success, social events, employee and family involvement, etc), typically develops positive attitudes among both customers and staff and their commitment towards the organisation. This is described in some cases as being 'optimistic expectations', because a positive attitude and commitment towards the organisation is not the same a positive attitude and commitment towards one's job, product quality or specific behaviour.

Alternate methods in implementing cultural change, identified during this investigation, are those by (Bate P. 1996). In this instance, four generic approaches to cultural change are recognised, and described as not necessarily 'culture specific', because in practice, there is little difference between people trying to change culture, structures, technology, operation systems, processes, or any other aspect of an organisation. The four approaches are briefly described as follows:

- **Aggressive:** Referred to as '*Cultural Vandalism'* or wilful attack on the traditional values of an organisation and its members, creating disruption and providing clear notice of intention to establishing a '*new culture order'*. These 'pre-civilised bullies' of the industry tend to live in the past and sometimes motivated solely by the desire to irritate and create trauma, and fortunately belong to a small minority within the business world. Additional terms used to describe this 'radical' approach to change organisational culture are *power coercive; conflict centred; non-collaborative; win-lose; imposed; dictate approach; and unilateral*.
- **Conciliate:** In contrast to the above, this approach believes cultural change can take place through '*non-dramatic, gradual and routine means*', and in many cases unnoticed by those involved. Although seemingly plausible, research suggests one remains sceptical, stating that it is more likely to be successful in bringing about '*first order development change'* rather than '*second order transformational change*' when using a conciliate approach. Additional terms used to describe this 'conservative' approach to change organisational culture are *group problem solving; win-win; collaborative, emergent; integrative; and joint approach*.
- **Corrosive:** This approach, seen by many as an essentially political process, can effect major change through the distribution of power and authority within the corporate hierarchy. In this case, the organisation is viewed in terms of a '*formal authority and informal power'* – i.e.: an invisible network of power structures that are shared by all, with no dominant party, and found difficult for a solution to be imposed by any individual or group. Ones this '*old boys network*' culture is established, changing it becomes increasing difficult due to the status quo. Additional terms used to describe this 'corrosive' approach to change organisational culture, are *coalition; unplanned; evolutionary; networking; and informal approach.*
- **Indoctrinate:** Through cultural training programs, organisations and their members can focus on the concept of cultural change as a 'learning process' (Schein E. H. 1999). Yet, because training is in its broadest sense planned and programmed, it makes this approach in establishing a new culture different to the rest – i.e.: these cultural programs are designed, planned, and presented, therefore seen as not being incidental, self-directing or individually centred. A change approach described as being less 'aggressive', by 'imposing' a 'suggested' culture in a peaceful, yet no more convincing manner. As such, this process may be better suited to 'technical' rather than cultural' forms of learning – i.e.: where a

training program is less sensitive to the special characteristics and qualities of cultural knowledge and learning requirements. Additional terms used to describe this 'learning' approach to change organisational culture are *normative, and re-educative.*

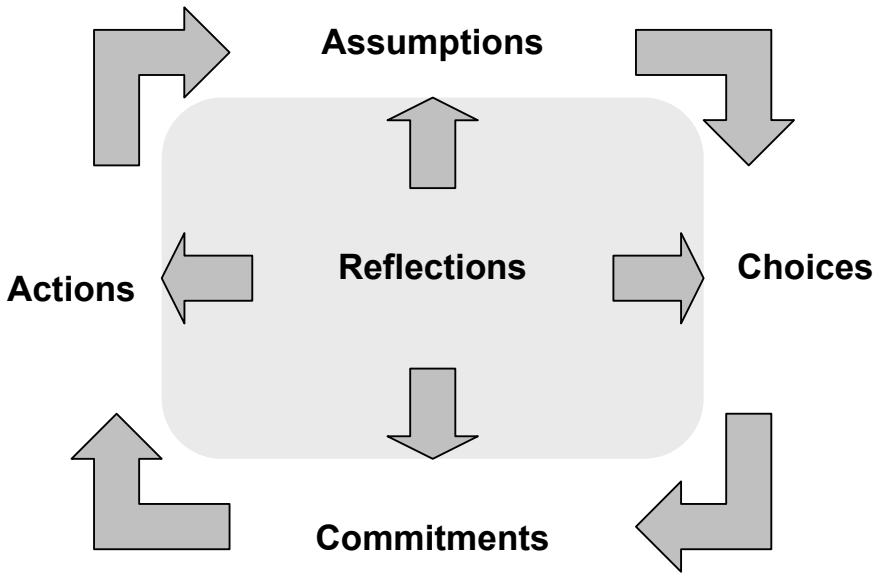
4.1.3 Process in culture change

The following sections consider four analytical frameworks often used to describe the process of culture change methods – i.e.: 'Change Process Model', 'Decision Making Model', 'Force Field Model' and 'Three-Stage Model'. Due to their very simplicity, these change models can be applied to a wide range of applications, whether at a group, individual or organisational level, and highlight the importance of a number of considerations in managing change, rather than portraying the '*true flavour of events'* accompanying change (Williams A., Dobson P. et al. 1993).

4.1.3.1 Change process model

For substantial change to occur, (Gilley J. W. and Maycunich A. 2000) recommends organisations adopt the Change Process Model (Figure 4-4), which enables them to facilitate change and improve its implementation.

Figure 4-4: Change Process Model



(Gilley J. W. and Maycunich A. 2000)

The above Change Process Model is made up of five critical activities to help ensure the long-term effects of change within an organisation:

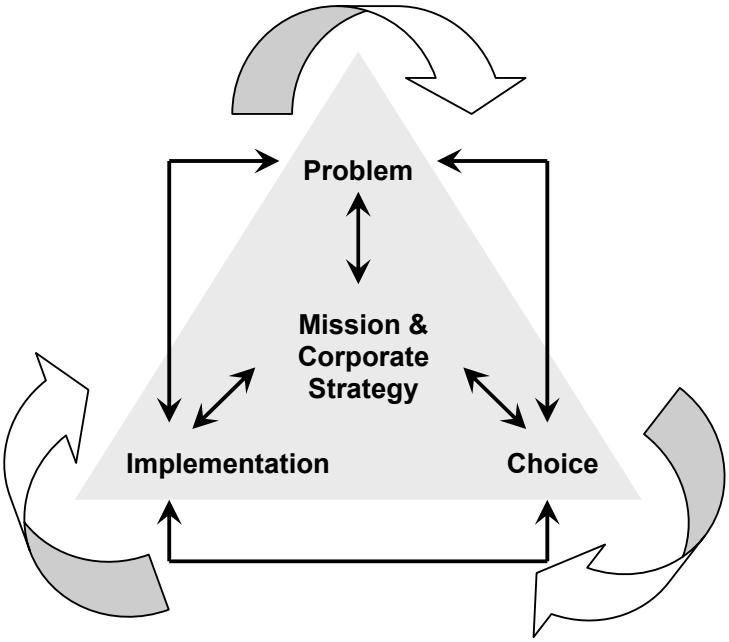
- **Identifying Assumptions:** As discussed in earlier sections of the report, assumptions can be considered as the '*taken for granted'* beliefs that individuals have about reality, and which guide their actions – i.e.: '*anchors to which most decisions are reached*'. Assumptions are to be isolated and fully understood before an organisation will advance and accept any change. The choices, commitments and actions that organisations take towards change are based on these assumptions.

- **Analysing Choices:** This is the best way for an organisation to understand the decision-making process - by allowing them to carefully construct a rationale for the decision made. The process includes examining how decisions are made, who participates in the decision-making process, what criteria are used to reach a definite outcome, and what consequences follow the choices made.
- **Making Commitments:** Once the above assumptions have been identified and analysed, then organisations can make commitments that bring about real and lasting change. When making commitment requires organisations to choose between two or more desirable outcomes, then leaders and their employees must determine which of the positive outcomes they desire most and which they are willing to allocate financial and human recourses over a lengthy period. In any event, organisations must minimise their risks and commit to choices they can live with (usually with positive and negative outcomes), both in the short and long term.
- **Selecting Appropriate Action:** This is the stage where organisations take definite actions to help satisfy their assumptions, choices and commitments. This may include the allocation of financial and human resources, restructuring of the organisation, etc., all of which enable the organisation and its individuals to make changes designed to bring about change.
- **Engaging Critical Reflection:** Described as perhaps the most important activity of the Change Process Model, where organisations attempt to understand why they made certain decisions. An activity that occurs after the completion of each of the four previous activities, thereby enhancing the individual's awareness of why an action was taken, but perhaps more importantly, how to improve upon that action.

4.1.3.2 Decision making model

The Decision Making Model (Figure 4-5) is a common and rational tool used to encapsulate the various stages management teams go through in solving organisational problems or in developing new opportunities in a change process (Williams A., Dobson P. et al. 1993).

Figure 4-5: Culture Change Decision Making Model



(Williams A., Dobson P. et al. 1993)

To follow, a few additional comments on the various headings used in Figure 4-5:

- **Corporate Strategy:** As highlighted in previous sections of the report, when planning a culture change, it has to be part of the corporate strategy of an organisation if it is going to have any chance of success. This 'need' for change can be triggered by either a 'crises' or an 'opportunity' that an organisation is faced with today, or likely to be faced with in future – i.e.: a 'preventative action' due to anticipated problems or opportunities.
- **Mission:** This refers to the agreed statement of the organisation's overall purpose, derived at by senior management during the process of developing the above organisation's strategy. This mission statement attempts to highlight the type of organisation it is and the nature of its business, by referring to issues such as standard of work, quality improvement, resources, influence on society, etc.

The remaining three elements or activities in the model are associated with the problem-solving concept:

- **Problem:** The first stage includes activities such as clarifying the nature of the problem, seeking further analytical information, etc.
- **Choice:** The second stage includes formulating possible courses of action or solutions, evaluating alternatives and finally making a choice of the most appropriate.
- **Implementation:** The final stage requires careful planning on how to put the chosen solution(s) into effect, the plan is then implemented successfully and adjusted if required, based on feedback information or evaluation.

The larger outer arrows in Figure 4-5 represent the revolving and ongoing influences the various factors have on the sequence of events when bringing about change in culture.

In summary, when using the Decision Making Model the following three guidelines are to be kept in mind:

- When planning to change culture, it must be grounded in the corporate strategy.
- Sufficient attention must be given to each of the equally important sets of activities within the model.
- The implementation of a culture change plan is most effective when those involved in the change can experience 'ownership' of the problem or solution – usually most effective during the early stages of decision-making.

4.1.3.3 Force field model

Based on early 1950's research into changing behaviours of individuals and social systems, (Williams A., Dobson P. et al. 1993) elaborated on a model portraying two sets of forces (driving and restraining) to help bring about change. According to (Schein E. H. 1997), all 'human systems' attempt to maintain 'equilibrium' and to 'maximise autonomy' in relation to their environment. Yet, if one wants to bring about change, then this equilibrium of concepts, beliefs, attitudes, values and assumptions must be disrupted or disturbed, either by strengthening the driving forces, weakening the restraining forces, or both. However, strengthening the driving forces without weakening the restraining forces is likely to place undue strain on the system, resulting in undesirable consequences such as resistance to change (Section 6), employee resignation, absenteeism, etc.

By using a similar model to that of Table 4-1, encourages one to firstly, identify the various forces impending on the change 'target' (e.g.: implementing an innovative ICT solution or process). Secondly, it encourages one to consider the relative strengths of these forces, and finally helps one explore alternative strategies to 'modify' these forces.

Table 4-1: Forces of Resistance to Organisational Change

FORCES DRIVING CULTURE CHANGE	FORCES RESTRAINING CULTURE CHANGE
• Change at the top	• Career-based organisation
• Powerful external influence	• Low turnover
• Vision of the future	• Success
• Powerful leader	• Stable environment
• Externally focused	• Criteria of success not visible
• Crisis or opportunity	• Lack of clear authority
• Acceptance of need to change	• Blindness to the need to change

(Williams A., Dobson P. et al. 1993)

Supporting the use of the above 'Force Field Model', (CRISP 2000) suggests a similar 'force-field' analysis be used, to map the driving and restraining forces to technological change (Table 4-2).

Table 4-2: Technological Change Force-field Analysis

DRIVING FORCES	RESTRAINING FORCES
• Innovation	• Time to market
• Cash for knowledge	• Competition
• Long term cost benefit	• Initial development cost
• Competitive advantage	• Risk of failure
• Time saving	• Initial development time
• Quality improvement	• Awareness of track record
• Education	• Knowledge sharing
• Financial incentive	• Understanding of process

(CRISP 2000)

Thus, the probability of change due to, for example, implementing an innovative ICT solution or process, will be high if:

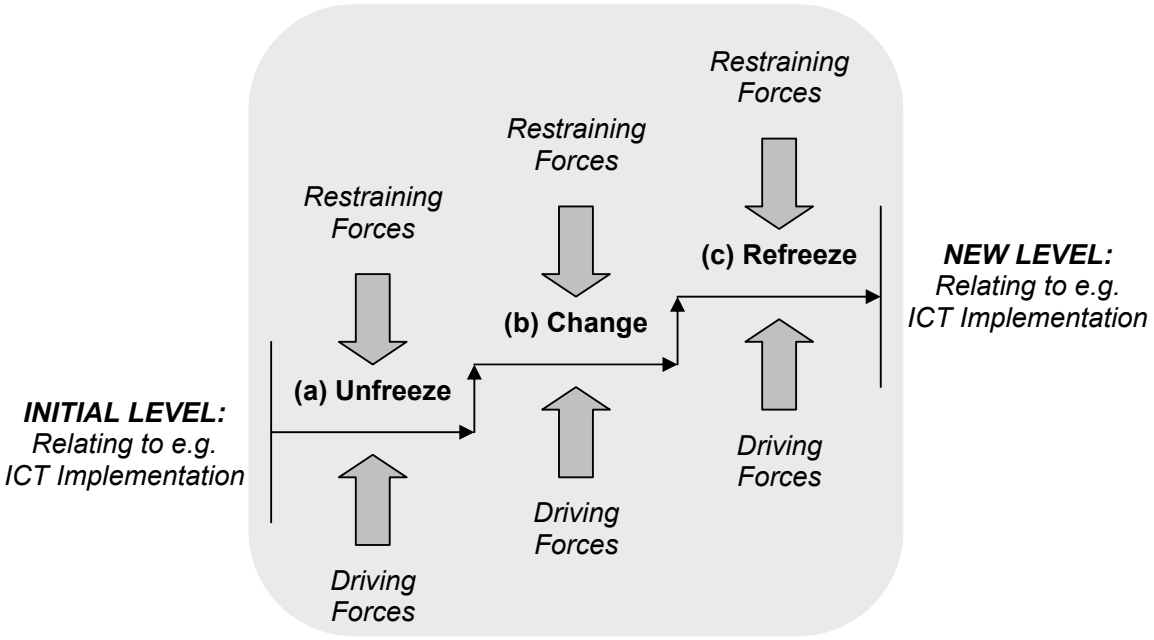
- The driving forces for change in the above model are strong due to, for example, a change in leadership within an organisation and/or there exists a powerful influence / demand from stakeholders / competitors, or
- The restraining forces, such as profit loss or unstable environment are weak, etc.

4.1.3.4 Three-stage model

Changing and organisation's culture can be a slow and ongoing process and in many cases proved difficult achieving. Hence, an increasing number of organisations are considering applying more of a 'revolutionary' change (rather than an 'evolutionary' change) in achieving their long-term goals. In this case, an environment is created where the '*old ways of thinking*

and acting' are simply no longer accepted, and employees are required to develop and/or adapt the new concepts, beliefs, attitudes, values and assumptions of the organisation (Williams A., Dobson P. et al. 1993). The Three Stage Model (Figure 4-6), which again is based on early 1950's research and elaborated on by (Williams A., Dobson P. et al. 1993) and (Schein E. H. 1997), is yet another useful and 'revolutionary' mechanism in bringing about change in culture. Achieved by firstly, 'unfreezing' existing forces, secondly, introduce change (geared to re-establishing the 'equilibrium of forces') and finally, to 'refreeze' the new situation.

Figure 4-6: Three-Stage Model



Adapted from (Williams A., Dobson P. et al. 1993)

The first stage (a) in the above culture change model is to 'unfreeze' the existing forces, which are usually based on concepts, beliefs, attitudes, values and assumptions. This stage is composed of three different processes, each of which must be present and deemed vital in ensuring the development of any motivation (need) to change. Therefore, change 'agents' are to ensure:

- There is enough disconfirming data to cause serious discomfort and disequilibrium. In this case disconfirming data is referred to as '*any items of information that shows the organisation that some of its goals are not being met or that some of its processes are not accomplishing what they are suppose to'* (Schein E. H. 1997) p299.
- That the connection between the above disconfirming data, and important goals and ideals cause sufficient anxiety and/or guilt.
- There is enough 'psychological safety', where members of the organisation can see a possibility of solving the 'problem', without the loss of identity or integrity, thereby allowing them to acknowledge the disconfirming data rather than defensively denying it.

Once the original forces of an organisation are 'unfrozen', the second stage (b) is to introduce 'change', by incorporating similar culture change methods discussed in earlier sections of this report, and aimed at re-establishing the equilibrium of forces (but at a new level) – i.e.: either by strengthening the driving forces, weakening the restraining forces, introducing new forces, or all three. The final stage (c) in the Three Stage Model is that of 'refreezing', where members of the organisation recognise the 'new' level of forces and change methods used, as well as the extra,

yet in many cases temporary, attention being paid by senior management. To ensure that the 'new' culture towards, for example, ICT implementation is a stable and inherent feature of the organisation, is to ensure the forces that were changed during this process (e.g. methods of rewarding performance) continue to operate normally. Only once the effects of the planned culture change are successful, will the underlying concepts, beliefs, attitudes, values and assumptions towards ICT implementation, become 'frozen' in the organisation.

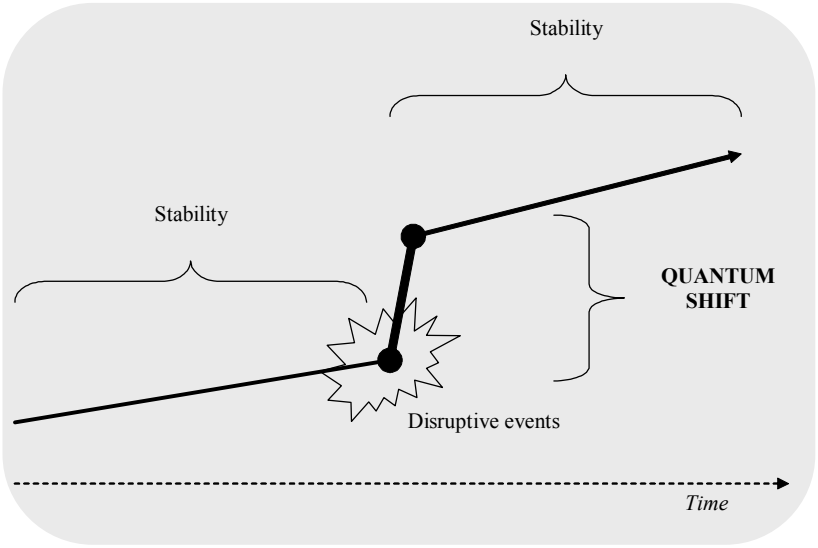
Finally, although the Three-Stage Model is referred to as a 'revolutionary' change mechanism, it does not mean a new culture will be created overnight, but that the 'unfreezing' process of an old culture will be rapid and more permanent, providing a strong base for developing new concepts, beliefs, attitudes, values and assumptions for the organisation.

4.2 Technology Driven Change

At the beginning of the twentieth century, the 'industrial era' was born through a 'quantum shift' - from an agricultural to an industrial economy (Figure 4-7). As a result, original ways of working and techniques for managing complex organisations had to be changed, consequentially causing the rise and continuous improvement of mass production tools (efficiency) and classic management techniques ever since (Youngblood M.D. 2000):

- 1960s: Innovation - challenging the established norm;
- 1970s: industrial strife and conflict between employer and employee;
- 1980s: enterprise culture with strategic alliances and privatisations; and
- 1990s: short term contract, outsourcing, flexible workforce and a long 'working hours' culture (Cooper C.L. 1999).

Figure 4-7: Disruptive Events (Change) - Causing a 'Quantum Shift'



(Youngblood M.D. 2000)

Arguably, a wide range of technologies and e-activities, including, computers, email, Internet, Web sites, etc. dominate today's Industries, businesses and personal worlds, finding it more and more difficult to function without them. With change being the *'only thing constant in our world today'*, many industry participants are 'seduced' by these new technologies, 'blinding' them from being focused on the real reasons and need for change (Hee H. 1998). Yet, few

could have predicted the massive changes and effects the introduction of these innovative technologies would have on today's industry business environment:

- Trends towards global business (globalisation and increased competition)
- Breakthroughs in technologies that have empowered users to be able to work physically independent of organisation based facilities (technology, knowledge and skills)
- Changes in personal lifestyles that make non-traditional work process more acceptable (demographic trends)
- Sophisticated and increased demand of clients
- Increased complexity and decreasing time pressures (pace of economic change)
- new employment patterns, organisational structures and changing clients
- growing importance of environmental issues and pressure groups (Grenier R. and Metes G. 1995; Flanagan R. 1998)

4.2.1 Assumptions

For today's industry organisations to cope effectively in a rapidly changing environment they must be able to continuously update and improve their information flows, tools and process by using ICT more effectively (Schein E. H. 1997). Yet, when an organisation, group or team decide to implement certain new / innovative ICT or Internet-based tools, systems or processes, a major change in its current 'technical system' takes place. The implementation process alone may result in behavioural and cultural change, where employees are taught new techniques and behaviours, rather than directly changing their beliefs, attitudes, assumptions and values. Then again, failure to consider existing attitudes and values may well result in dissatisfaction, minimal involvement and antagonism towards the new technology (Williams A., Dobson P. et al. 1993).

A major step in improving the implementation and utilisation of any ICT solution within an organisation is to firstly recognise and respect the fact that ICT developers or implementation team, senior management, and end users, are essentially sub-cultures with their own set of assumptions regarding the implementation and use of the ICT solution (Schein E. H. 1997). Considering these sub-culture assumptions is essential, especially when the success or failure of the implantation is directly dependent upon, for example, senior manager and employee satisfaction in the use of the system, and not on the type of ICT system implemented.

4.2.2 Consequences

Today, the development of ICT can be compared to that of the industrial revolution, where the predictions of its impact on society are described as being 'bewildering and controversial' (Ahmad I. 2000). The success and survival of industry organisations will depend largely on how 'valuable' strategic principals are developed, adopted and acted upon in the wake of technological change / ICT 'revolution' and how the industry's contains its increased 'dependency' on the 'connectivity' of the Internet. As a result, some of the impacts facing industry organisations include:

- **Hectic pace:** New process innovations and product introductions have accelerated. Product life cycles are becoming shorter. New industries are emerging. What made a business successful may not keep it successful in the end. Sayings like '*Don't fix it if it isn't broke*' is changing to '*If you have been doing it the same way for the past 20 years, chances are you are not doing it right anymore*'
- **Increased productivity:** More work can be done in less time. The cost of time may go up as a result. Mistakes will get costly too. The demand for higher quality and 'zero defects' will increase. The traditional client-designer relationship may change. Clients will demand fast turn-around times, while designers will be competing among themselves for creative designs and quality products.

- **Legal infrastructure:** A new legal infrastructure for contracting and doing business using ICT and the Internet will have to evolve. Different standards and meanings will come into play in cyberspace regarding such issues as signatures, time stamping, intellectual property, privacy, liability, and jurisdiction.
- **Power of knowledge:** ICT education will somehow have to be incorporated as a supplement to technical knowledge and expertise in various fields. The workforce of the A/E/C industry will have to embrace the ideas of on-the-job education, continuing education, and part-time graduate study.
- **Creative destruction:** ICT and the Internet enable industry participants to bypass many business functions. Many '*reinventing-the-wheel*' type functions will become obsolete within the organisation as well as the industry. The demise of certain functions may give rise to uneasiness and resistance in the industry. Yet this phenomenon should be viewed as '*creative destruction*,' since new and better ways of doing business are replacing old and unnecessary ones.

The above 'impacts' are supported in (Gann D. 1997) with the following 'scenarios' in which new technologies (eg. ICT) - coupled with significant organisational change and skills development - could improve performance characteristics in construction:

- **Production process (as a whole)**: the total process, current levels of inefficiencies and waste materials, could reduce labour and time, as well as pollution in half - by streamlining supply chains and through the introduction of better management practices. New ICT systems could improve performance and help integrate briefing and design decision-making and improve 'flexibility' to meet customer needs.
- **Output**: it is unlikely that construction output will increase. However, new construction activity could be stimulated (with additional investments made), if significant cost reductions can be achieved through technical and organisational change.
- **Employment**: technical (e.g.: ICT) innovation aimed at improving performance, is likely to have serious consequences for employment, training and recruitment.
- **Productivity**: when considering the total process (from initial client discussions to completion and operation of facilities), there is vast room for performance improvement (directly related to technical and managerial competence). Successful demonstration projects have illustrated major performance benefits through the implementation of new ICT systems (for coordination and control) together with component-based approaches in construction.
- **International competitiveness**: the development of further technical (and ICT) capabilities in international construction and consulting design and engineering firms could increase export markets.
- **Quality of products**: technical change in materials, components and systems integration could improve physical and aesthetic durability, and reduce embodied and life-cycle energy costs.
- **Cost and prices**: technology is one of a number of factors affecting construction prices. Unless these costs and prices are kept under control, construction is likely to loose support through substitution for other investment industries and commodities.

From a cultural perspective, Table 4-3 illustrate the effects of implementing a technological change on, for example, the four corporate culture 'tribes' outlined in Appendix II:

Table 4-3: Cultural Effects When Implementing a Technological Change

CULTURE	EFFECT WHEN IMPLEMENTING A TECHNOLOGICAL CHANGE
Tough-guy / Macho	• The immediate feedback fosters a short-term perspective. • Does not support a strong planning orientation - lead to difficulty in implementing a reengineering process. • Speed, not endurance is often the focus. • Not taking an action, however, is as important as taking one. • Strong internal competition, which breeds individualism and weak communication.
Work hard - Play hard	• Action-oriented where success comes from its persistence. • Amount is more important than quality. • Listing the number of benefits of a reengineering process will foster more commitment than giving details on a few benefits. • Immediate benefits must be highlighted whenever possible.
Bet your company	• The ritual of the business meeting where important issues will get full discussion. • Decision-making is top-down once all the inputs are in. • Actions are measured and deliberate. • Once the importance of a reengineering process is evident, specific decisions are made by top management and the plan starts becoming a reality. • Decision makers have a great deal of character and self-confidence, which should enhance good follow-through on decisions. • People become highly dependent on one another (never 'burn any bridges') - implying better-than-average co-operation and communication between departments during the implementation effort.
Process	• Policies and procedures are critical to a successful re-engineering effort. • Everything must be put into a memo and/or documented. • Job titles play an important role - therefore as new responsibilities are created or delegated, careful consideration should be given to job title and perceived status.

(Revenaugh D. L. 1994):

The industry has to realise the cost of delaying any technologically driven changes is in many cases not only inconvenient, but often, catastrophic (Black J. S. and Gregersen H. B. 2002). When the implementation of a new ICT solution or process, for example, drives the change in an organisation's culture, organisation leaders have to realise from the outset that hierarchical imposed solutions usually do not work well when sub-cultural differences and conflicting assumptions are involved. Instead, new intercultural processes are to be developed, permitting better communication between the sub-groups, and allowing the strengths of each to interact to form an integrative and new implementation solution (Schein E. H. 1997). If this process is not undertaken and managed correctly, then the old (traditional) and new (ICT) practices will only superficially and temporarily co-exist, resulting in the organisation's original '*way of doing* things' to eventually resurface (Palmer I., Dunford R. et al. 2001).

4.3 Summary

In today's increasingly competitive and ever changing construction industry environment there are no 'quick fixes' to truly help deliver long-term excellence within individual organisations, groups and project teams. The pace, size and complexity of change is greater than ever before and overwhelming many of those who face it. Changes such as:

- The need to transform a business that succeeded for years by focussing on customer service that must now focus on technical proficiency to keep up with increased domestic and global competitiveness;
- Redesigning and adapting existing jobs to incorporate these new and never used before technologies; or
- Changing the current culture and sub-cultures of an organisation from, for example, a 'deliberation' culture, to a fast or 'first-mover' (Black J. S. and Gregersen H. B. 2002).

Change has always been and remains difficult. Organisations will change only as far and as fast as its collective individuals are willing to change, because people are and always will be 'instinctively programmed' to resist any change. Therefore, to change any organisation strategically and successfully, one must first attempt to change the individual beliefs, attitudes and values (culture) within the organisation before the organisation as a whole can benefit (Black J. S. and Gregersen H. B. 2002). Yet, culture is known as being '*complex'*, '*multi-levelled*' and '*deeply rooted*,*'* a concept that must be observed and analysed at its every level before it can be fully understood or successfully changed and managed (Williams A., Dobson P. et al. 1993; Schein E. H. 1999).

Culture is also not a sure or stand-alone remedy to achieve, for example, improved organisational performance. When examining or attempting to change 'culture', industry organisations are to take into account that 'culture' is never 'singular' and always 'plural'. Therefore, attempts to change the 'whole' culture of an organisation must be abandoned, because every culture is made up of a whole range of mentalities and sub-cultures, all of them different, and at different stages of development (Bate P. 1996). Fortunately, the last few years have increased the relevance and importance of organisational culture and the need for it to be changed (Williams A., Dobson P. et al. 1993).

The development of an adaptive and innovative culture is said to be one of several critical and mutually reinforcing variables and activities which organisations must implement and manage effectively. Industry organisations need to define their objectives; decide on how best to achieve them; develop effective tools to evaluate the progress; and finally, learn how to do this against a background of constant change (Williams A., Dobson P. et al. 1993). Further suggesting construction industry organisations not only manage change, but also build their collective capabilities in order to turn continuous change into competitive advantage. This, according to (Grenier R. and Metes G. 1995), can be accomplished by firstly, letting go of current 'managing change beliefs', and secondly, build an innovative and adaptive culture that can work within a continual change environment.

Culture change, in some cases, may be crucial to the success or even 'survival' of an organisation, group or team – i.e.: whilst the development of an appropriate culture can be a strong asset, so can an inappropriate culture be a strong liability. As such, the change of culture must be strategically driven, and the change process supported by the full commitment of the Chief Executive (or equivalent). This commitment alone will certainly not guarantee the successful change in culture, and therefore needs to be managed and monitored continuously and effectively throughout the change process. It also cannot be assumed, when trying to change an influential or dominant culture, that any single change mechanism (e.g. new reward

system or training program) will be sufficient, because in isolation, it is likely to be ‘absorbed’ in an existing and more dominant culture (Williams A., Dobson P. et al. 1993). Two difficulties will almost certainly be encountered when changing organisational culture. The first is coping with resistance to change, and the second is ensuring that changes achieved continue after the ‘sponsors and supporters’ of change have gone (Williams A., Dobson P. et al. 1993).

“*Culture change is likely to become more, rather than less, significant over the coming decade. Increasingly though, organisations will have to treat such change, not as a one-off, discrete phenomenon, but as a continuing process which constantly reviews, refines and improves the organisation’s overall capacity to respond to external developments*”
(Williams A., Dobson P. et al. 1993) p xi

5 DRIVERS OF CHANGE

5.1 Motivation

As stated earlier, in today's competitive and ever changing construction industry environment there are no 'quick fixes' to help deliver long-term change and excellence. Based on various experiences within the industry, there are undoubtedly many responses to the following question.

"*Does there have to be some threat or sense of failure or crisis before people are motivated to make changes?"*
(Schein E. H. 1999) p116

One of the answers is simply 'yes'. For any change to occur within an organisation, group or team there will always be some sense of threat, crisis, or dissatisfaction present – i.e.: motivation - in which the '*original way of doing things*' (usually confronting or challenging that change) will have to be unlearned before '*the new way of doing things'* can be learned (Section 4 – Three-Stage Model). This is mainly due to people trying to maintain a 'stable equilibrium' in relation to their environment, and for any change to occur, will mean certain new forces will upset this equilibrium. Therefore, recognising and managing these driving forces (via the identification of either a threat or an opportunity) creates the motivation to change (Schein E. H. 1999).

There are of course many driving or motivation forces (including economical, legal, technological and political) organisations, groups, teams and individuals may need to consider when deciding to implement a certain change process (Schein E. H. 1999). Many organisations undergo various forms of culture change due to, for example, a financial crisis, a declining market share, a change in customer expectations, intervention by stakeholders, or competitor initiatives (Williams A., Dobson P. et al. 1993). It is similar kinds of events or drivers that justify, for example, the additional expenditure on specialised training; the implementation of new ICT systems or procedures; or the undertaking of future redundancies.

5.2 Leadership

"Culture and leadership are two sides of the same coin."
(Schein E. H. 1997) p15

That is to say, leaders first create cultures when they create groups and organisations. Leadership has been studied to a similar if not greater extent to that of culture – i.e.: looking into what leadership is all about, whether one is born or made a leader, etc. When a culture, for example, becomes dysfunctional, it is the unique role of leadership to perceive the functional and dysfunctional elements of an existing culture, and to manage cultural change in such a way that the group can survive in a changing environment (Schein E. H. 1997).

The most significant culture changes within organisations therefore occur when their leaders personally embark on a course of action during the change process (Carucci R. A. and Pasmore W. A. 2002), and/or when there is an actual change in leadership. Introducing new leaders is a highly influential driver of change, because they usually bring with them new ideas, recipes for success, visions for the future, and experience (Williams A., Dobson P. et al. 1993). With these leaders being conscious and having a detailed understanding of the cultures and

sub-cultures in which they are embedded (Schein E. H. 1997), will ensure a more successful, and permanent change in culture within an organisation, group or team.

5.3 Beliefs and Rewards

People may continue to resist change, even though a clear 'picture' of the 'new destination' or future way of 'doing things' has been drawn. This is because the new destination must not only be seen, but must also be believed by those who are influenced by this change or new way of 'doing things'. There are three steps to help people move forward and 'believe' in a change process and what it promises. These three steps, according to (Black J. S. and Gregersen H. B. 2002), emerge from the most tested and validated theories in human psychology and management – i.e.: the expectancy theory - helping overcome the resistance of people not moving forward:

- **Step 1 – Destination:** Simply put, if the direction and destination are unclear to the individuals affected by the change, then the motivation for them to move forward is minimal. Ironically, people might also resit to change because the destination is in fact very clear.
- **Step 2 – Recourses:** Once the direction is clear in the employees' mind, they now have to be convinced they have what it takes to reach the new destination. If people believe they are able to reach the destination, they are much more motivated to try. If they do not believe this, they simply will not move forward or at least not very far. Once again, it is what employees believe that counts. To achieve this, change leaders must assess and then provide their employees with any missing required recourses (skills, knowledge; tools; manpower; etc). This may include substantial training and education, mentoring or coaching to help generate the essential capabilities required to master the new ways of 'doing things' when, for example, implementing a new ICT system or process into the organisation.
- **Step 3 – Rewards:** A familiar way of motivating people to move forward and change is if they believe their efforts will be rewarded. Contrary to many beliefs, money, although one of the more powerful is not the only motivating reward people seek – i.e.: Money is a necessary means to what people truly value (college education for a child; vacation; security; ego; status; friendship; fun; etc). Research indicates immediate and repeated 'reinforcements' employees receive for doing good work are much more powerful than, for example, annual bonuses. To help change leaders understand what motivates their employees, (Black J. S. and Gregersen H. B. 2002) suggests considering the ARCTIC Approach (Achievement, Relations, Conceptual/Thinking, Improvement and Control), which encompasses the major categories of motivational values and needs (Table 5-1):

Table 5-1: The ARCTIC Approach for Rewards

ARCTIC	RELATED SUB-DIMENSIONS
Achievement	• **Accomplishment**: The need to meet or beat goals or to do better in the future than one has done in the past. • **Competition**: The need to compare ones performance with that of others and to do better.
Relations	• **Approval**: The need to be appreciated and recognised by others. • **Belonging**: The need to feel part of and accepted by the group.
Conceptual / Thinking	• **Problem Solving**: The need to confront problems and create answers. • **Coordination**: The need to relate pieces and integrate them into a whole.
Improvement	• **Growth**: The need to feel continued improvement and growth as a person, not just improved results. • **Exploration**: The need to move into unknown territory for discovery.
Control	• **Competence**: The need to feel personally capable and competent. • **Influence**: The need to influence others' opinions and actions.

Although there is no doubt that the above needs and values varies from person to person, it is important for change leaders within an organisation to better understand what motivates their individual employees to move forward, which inturn will ensure the organisation as a whole to move forward too. Larger organisations may feel this is time-consuming if not impossible to try to determine what the needs and values of hundreds of employees are. The trick here is to 'cascade' and customise this process down the organisation. That is to say, the most senior leaders of a large-scale organisation undertakes the task of determining their own motivations to change, and then delegate the task and customisation of rewards down the hierarchy of the organisation.

"If those people below you don't move individually, the entire organisation doesn't move either, and then you are left with unfilled promises and disappointed shareholders."
(Black J. S. and Gregersen H. B. 2002) p86

5.4 Training and Education

Many organisation leaders bring about change and convince employees and managers of the need to '*do things differently'* through training and education. Unfortunately,

"Employees do not always believe what their leaders tell them unless they are educated to the economic realities of their business."
(Schein E. H. 1999) p120

Unlocking an individual employee's potential creativity, skills, and ability to communicate effectively and timely, is believed to be the greatest opportunity for organisations to develop and improve long-term efficiencies. If untrained and unfairly treated, employees are less likely to perform to their full potential (Gupta A. and Thomas G. 2001), (Linowes J.G. 1999) and (Swe V. and Kleiner B.H. 1998). Benefits gained from investing in improving the skills and knowledge of employees, who in many cases, are the single biggest expenditure of an organisation (as much as 60%), include:

- highly trained and motivated workers leading to more successful firms;
- better training will raise industry standards and improve employment prospects;
- a healthier and happier workforce;
- an improved image for the industry and attraction of more skilled people;
- research and development has long-term economic gains;
- an innovative environment that will stimulate and create more and better ideas;
- more flexible use of multi-skilled people; and finally
- a high-tech image delivering improved social benefits will make the construction industry more attractive as a career for the younger generation (Foresight 2000).

Therefore, to invest in developing its most valuable resource (employees) of an organisation, and who ultimately determine its productivity and profitability, seems logical and essential, and a major driver for change (O'Donaghue A. 2001).

6 BARRIERS OF CHANGE

6.1 Technology

The industry has to realise that investing in ICT is no longer primarily buying a piece of hardware or software. It is now more of a potential long term investment in the process of change itself (Cleveland Jr. A.B. 1999) and (Buch K. and Wetzel D.K. 2001). Unfortunately, the nature of the industry's constructed products, and its organisations and processes, limit technological change within the industry (Gann D. 1997):

- site-based nature of erecting, assembly and installation, together with the need for durability, signifies that firms often prefer to use (what they consider to be) tried and tested techniques, tools, systems, and processes, etc.;
- buildings and structures becoming more complex - often involving the integration of expensive systems; and
- legacy of sunk costs.

In an 'ideal world', every member within an organisation, from senior executives down to site personnel, are constantly looking and embracing new and innovative technologies that make their work more effective and simpler (Grenier R. and Metes G. 1995). However, in the 'real world', a typical organisation and its craving for innovative technology remains in most cases a dream, due to harbouring any of the following reasons for not investing in or using it:

- Executives, who are responsible and accountable for the present and future financial position of an organisation, being convinced that investing in ICT is more of a cost factor (producing unacceptable returns), rather than a value generator;
- Perception that it is bad business and equally non-contributing, to replace old, unused, or broken technologies, with new ones.
- Difficulty in getting integrated ICT systems.
- Large percentage of managers and employees don't know or even care about the potential of innovative ICTs because they are satisfied and very much use to the way they work and do business.
- Insufficient stakeholder drive.
- Lack of time (too busy) to implement or learn a new a new technology or process.
- The fear (of potential embarrassment) that even with formal training and education available, certain individuals may still feel inadequate or too stupid to use this new technology (Whyte J. 2002).

It is also important for implementers of an innovative ICT tool or system, not to 'camouflage' the true nature of a change prior to its implementation – i.e.: not to portray the change as less dramatic and positively beneficial to the employees and the company. This 'clouded' employee 'programming' is the grounds of resistance towards technological change (Hughes T., Williams T. et al. 2000). Middle managers, for example, may be convinced of implementing an innovative ICT system and realise its importance to business needs, but may be confronted with dissatisfaction and unresponsiveness from employees and even senior management due to lack of knowledge, awareness or understanding (Kaarst-Brown M.L. and Robey D. 1999).

6.1.1 Assumptions

Many managers assume people turn to technology, databases or policy procurement manuals to obtain information. Yet, according to (Cross R. and Baird L. 2000), people usually rely upon a network of relationships for information and advice – i.e.: rather than turning to a capable

technology, database or other sources of electronic information, employees are five times more likely to turn to friends or business colleagues for answers. Technology is described here as simply: '*a tool for building relationships; facilitating the exchange of ideas among colleagues'*; and only one form of 'memory' that employees tap when solving problems – i.e.: the use of technology is therefore limited (Cross R. and Baird L. 2000).

6.2 Culture - '*Technology is not enough'*

Arguably, travelling along the information 'super-highway' is crucial for information exchange, information gathering, speed and ease of doing business (Linowes J.G. 1999). Yet, the success of any profession is described as going beyond simply exchanging electronic information. That successful ICT implementation requires careful consideration to the 'human touch' (Claver E., Llopis J. et al. 2001) and (Gore Jr E.W. 1999). Fortunately, the link between implementing innovative ICTs and organisational (cultural) change is not a new phenomenon (Uren D. 2001).

6.2.1 Technology and people 'misaligned'

According to leading UK ICT researchers and consultants (Cabrera A., Cabrera E.F. et al. 2001), 80-90% ICT projects fail to meet their performance goals due to organisations giving inadequate attention to non-technical (human and organisational) factors - termed 'critical determinants' of new system effectiveness. Organisations must realise when undergoing a technology driven change, that ICT is only one of several inter-related components, which drive organisational performance. Organisations must be able to efficiently manage the changes imposed (e.g. from introducing a new ICT) in such a way as to minimise the human costs of the transition while maximising the benefits from the technology.

An organisation can have the optimum ICT implementation strategy, but if its culture is not aligned with and supportive of that strategy, the strategy will either stall or fail (Schneider W.E. 2000). The last available mechanism left for organisations to improve their competitive position is by considering people (human resources) along with technology. By employing a dedicated, highly skilled, flexible, co-ordinated, committed and productive workforce, coupled with a leaner, flatter and more responsive organisation will ensure a more effective and successful implementation of innovative technologies (Morley M. and Heraty N. 1995).

Furthermore, when considering the implementation or adoption of new ICTs into long-established organisational arrangements and multiple work cultures, one can not assume once electronically and simultaneously linked, that it will automatically ensure an increased sense of community, improved ability to collaborate or improved understanding of others (Graham M.B.W. 1996). On the contrary, organisations and ICT users are now faced with increased burdens of regular (mostly unintended) misinterpretation and mistakes.

7 TRENDS AND RECOMMENDATIONS

7.1 Cultural

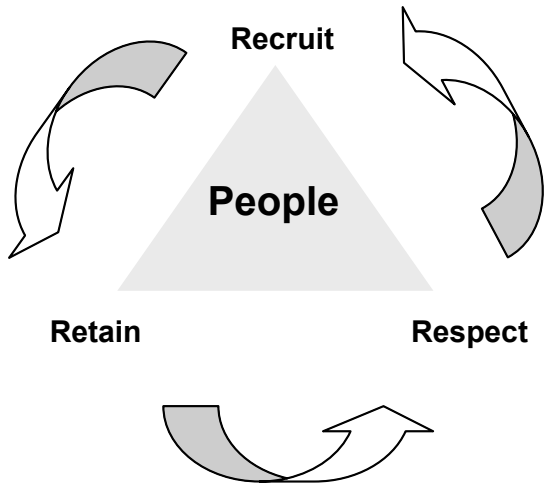
Changing culture is inevitably a slow process, where the all too common phrase "*you can't change culture overnight*" becomes a major excuse for not changing culture at all. In many cases organisations have attempted to change their culture, and employees only learn the basics of this 'new' culture without fundamentally altering their 'old' culture (beliefs, values, and attitudes, etc). As such, the 'new' culture is only superficially different from the old, and where it is only a matter of time before the traditional '*ways of doing things'* resurface (Williams A., Dobson P. et al. 1993). The following sub-sections are provided in an attempt to help overcome these 'excuses' for not changing existing cultures.

7.1.1 Invest in people

In an attempt to 'radically improve' the industry's performance on 'people issues', a working group was set up and charged with identifying practical and effective ways in which the construction industry could improve its performance (Rethinking Construction 2000). Research outcomes identify the 'failure' of leading firms 'respecting people' potentially caused irreparable damage to their 'bottom line'. In addition, the 'gap' between the 'respect' demonstrated towards operatives (blue-collar workers), and that shown for white-collar workers (management), is identified as perhaps most damaging of all.

Therefore the most urgent business challenges currently facing the industry is not the implementation of innovative technologies, but 'looking after people' (Figure 7-1) – i.e.: companies who fail to improve their attitude and performance towards **respecting** their own people and others, will fail to **recruit** and **retain** the best talent and business partners (Rethinking Construction 2000). This challenge is also recognised in (Linowes J.G. 1999) where '*holding on to good people'* is regarded as today's management challenge. Further stating that today's talented professionals are highly sought after yet have increased opportunities in choosing the most appealing work environment.

Figure 7-1: Industry Business Challenges



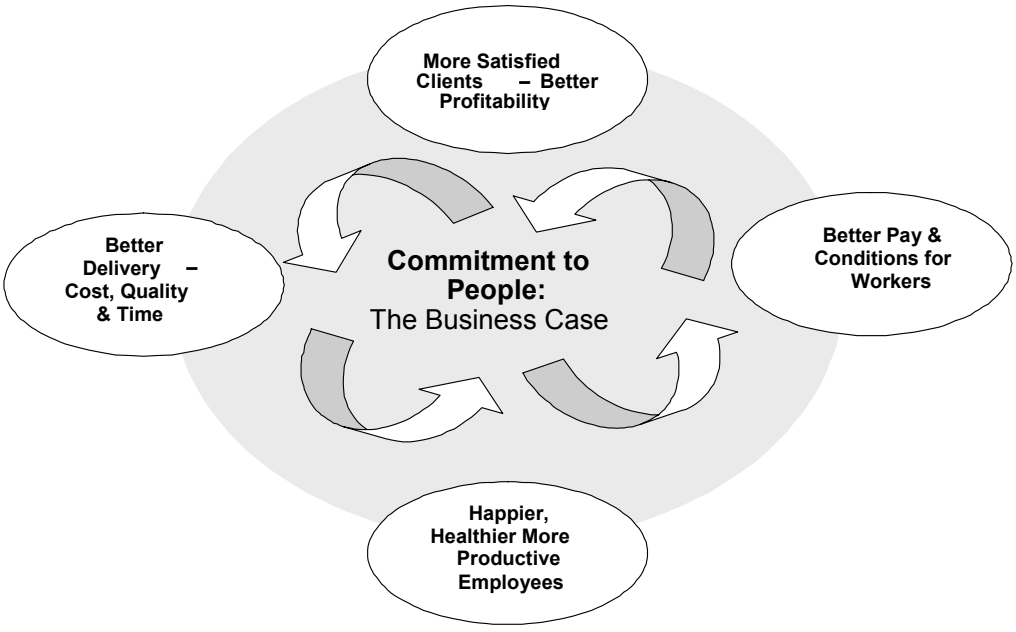
(Rethinking Construction 2000)

Furthermore, all construction industry organisations, large or small, should quickly realise the benefits when, for example, implementing a new ICT tool / system, if they practice to respect and include their people in the decision making process. This will ultimately affect the way they currently operate, by providing:

- an improved level of professionalism (unknown in the past);
- a better standard of work;
- more cost effective projects;
- fewer delays and expensive mistakes;
- fewer accidents and less ill health;
- reduced staff turnover;
- earlier completion dates;
- an advantage over competition; and
- increased repeat business (Rethinking Construction 2000).

The renewed respect and involvement of organisational and project personnel are supported in (Rethinking Construction 2000) – i.e.: to ensure improved and overall performance, it is important to involve, engage and empower all people in issues that directly affect them (Figure 7-2). Further supported in (Graham M.B.W. 1996) stating 'non-technical people' need to take their share of responsibility to 'bridge the gap' between those who invented / developed work supporting technologies (e.g.: ICTs) and those who 'criticise' innovative technologies as 'unappealing' and 'unsupportive' of their work.

Figure 7-2: Business Case for Commitment to People



(Rethinking Construction 2000)

7.1.2 Shared ownership

People are (generally) more committed to plans and activities when they share the 'ownership' of those plans. This 'employee participation' is essential, because any organisational policies and plans will have an impact (in one way or another) on their 'working' lives (Baines A. 1998). Yet, on the other hand, these 'ownership cultures' can also fail, due to:

- Employees having 'initiative fatigue'.
- Even though employees are generally and initially receptive, they may not understand the 'proposal' due to it being too complex, unconventionally written (too technical) or presented (different format).
- 'Managers listen - yet do not change' as they may be threatened by perceived 'disempowerment'.
- New or Improved plans, suggestions, recommendations, alternatives, methods, etc., are not supported by appropriate and timely actions from decision makers.

7.1.3 Trust in project teams

Due to the 'complexity and turbulence' of today's global business environment, a move towards 'team-based organisations' is suggested, by changing the way people currently interact and work within industry organisations. Furthermore, the success of implementing these 'autonomous' / self-directed / cross-functional working teams (to boost effectiveness and productivity) is dependant on conducting an organisational culture and structural analysis prior to its implementation (Tata J. 2000) and (Unknown 1997). Yet, although many organisations believe and trust in the teamwork concept of: having regular team meetings; sharing of ideas; experiencing 'spirit' of team work; and realise the potential benefits it can bring, it is not easily achieved or maintained (Hiley M. 2001).

7.1.4 Culture change program

Companies who wish to become that 'excellent' company and experience increased competitive advantages (e.g. implementing an innovative ICT tool or ICT training evaluation program), may very well have to introduce a 'culture change program' that gradually 'cultivates' the existing culture to accept change - rather than rely on the outcomes of traditional / outdated management-led initiatives (Lewis P. and Thornhill A. 1994). However challenging or far reaching the essential results may seem, they are achievable by implementing the following 'change program activities':

- **Defining the desired goals:** described as the difficult task of defining clear, measurable, and time-specific goals of attitudes, beliefs, and behaviours of personnel.
- **Analysing the current state:** referring to earlier research, (Lewis P. and Thornhill A. 1994) recommends this form of analysis can be achieved by comparing the organisations driving forces against the restraining forces of change (Section 4.1).
- **Reviewing the change strategies available:** various approaches to achieve organisational change are to be considered.
- **Deciding on the appropriate strategies:** even though this is proven to be a difficult task, researchers suggest answers to the following questions are potentially useful when deciding on which strategy to adopt:
  - *Are the strategies likely to gain the support of those who will play a part in their implementation (particularly senior managers)?*
  - *Do the strategies have the potential for yielding useful data quickly?*
  - *Have employees sufficient expertise to conduct the strategy successfully?*

- *Are the strategies too expensive and time-consuming?*
- *Are the strategies likely to involve those concerned with the implementation, being embroiled in organisational politics?*

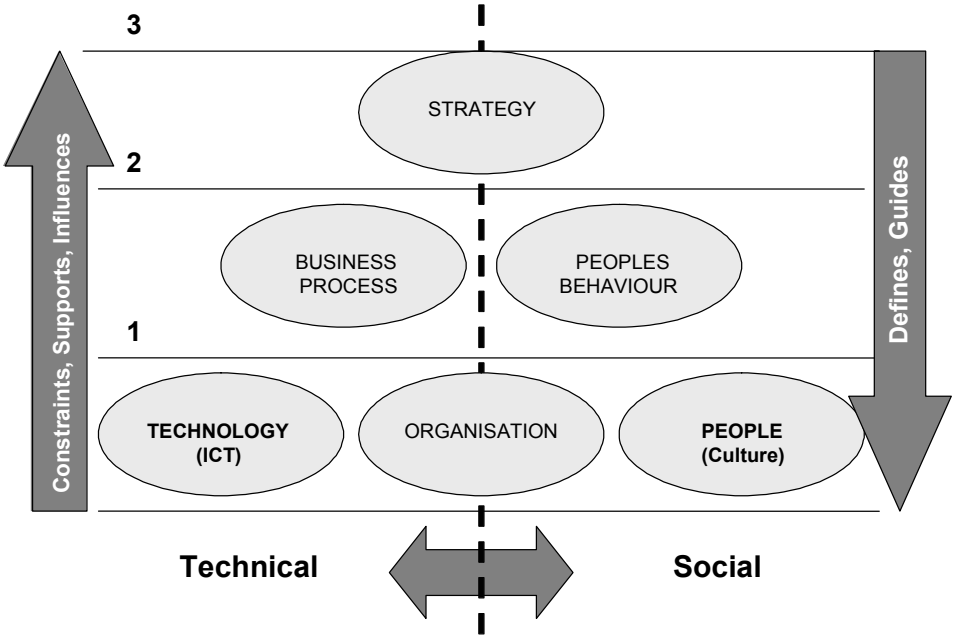
- **Implementing and evaluating the strategies:** based on (a) the answers to the above questions, (b) continuous monitoring and (c) ending with a thorough review.

7.1.5 'Align' technology with people

The task of 'aligning' technology and people (culture) is not an easy task, and that it is important to understand the interconnections between technology and people and their relationship with other important organisation sub-systems – i.e.: organisational structure; business and management processes; and strategy. Referring to Figure 7-3:

- **Level 1:** referred to as the '*infrastructure'* or '*architecture'* level contains the 'long lasting pieces' of the organisation – i.e.: organisation's technology, its structure and its people (including the set of managerial practices that regulate the relationship between the organisation and its members).
- **Level 2:** supports the system of complex activities carried out by the organisation, and include business processes and behaviours, which in turn form the capabilities of the organisation.
- **Level 3:** provides a more holistic view of the organisation's *strategy*. Strategy, in this case, refers to the way in which the organisation sees itself in relation to its stakeholders (customers, providers, shareholders, employees, government) and to the ways in which the organisation chooses to employ its resources in order to satisfy the needs of its stakeholders.

Figure 7-3: Organisational Performance Framework – Technical & Social Structure



(Cabrera A., Cabrera E.F. et al. 2001)

In addition to the above description of levels 1, 2 and 3, successful technological innovation and implementation requires either (a) the technology be designed to fit the organisation's current structure and culture, or that (b) the organisational structure (processes) and its culture (people) be reshaped to fit the demands of the new technology. Further suggesting industry organisations consider the following when faced with technology driven change:

- The implementation of a new technology can unbalance an organisation and its subsystems. Therefore, successful ICT integration depends on how well the organisation and its subsystems absorb these disruptions and adapt to a 'new equilibrium'. Failing to achieve this new equilibrium will result in a waste of time and resources.
- This equilibrium must be viewed along both *vertical* and *horizontal* dimensions (Figure 7-3) :
  - **Vertical**: refers to the alignment between the new ICT, the capabilities of the organisation, and its strategy. As there are no 'coherent universal technologies', a technological innovation would be invaluable to industry organisations, if it can contribute to generating the capabilities necessary for the organisation to achieve its objectives.
  - **Horizontal**: refers to the integration between the social and technical subsystems of the organisation. To successfully adopt a new technology, organisations have to adapt its structure and its human resource 'architecture' in a way that allows the new technology to be used by the right people in the right way and at the right times.
- Changes in the organisation's core technology will often challenge existing procedures and decision-making policies, and force the 'modification' of existing jobs and job assignments.
- The people subsystem – i.e.: the norms, values and basic assumptions shared by people within the organisation - provides a valuable medium to assess and manage technology driven change (Cabrera A., Cabrera E.F. et al. 2001).

7.2 Technological

7.2.1 Paper to Electronic

Project communication is becoming increasingly complex. Research has shown the 'rapid transmission' of effective project information / communication is vital (a key factor) to ensure project success and improved performance (Thorpe T. and Mead S. 2001) and (Olesen K. and Myers M.D. 1999). Current / traditional information and communication flows within the construction industry are mostly manual and hence slow (Anumba C.J. and Ruikar K. 2002):

- Producing numerous paper copies of documents and drawings.
- Management of 'loose' documents is often time-consuming and tedious.
- Library 'archives' of documents need to be maintained to effectively access data as and when required.
- The reliance on third parties, such as courier services, can lead to delays.
- The added expense incurred in the delivery of project documents to project members who are geographically distributed.

Paper as a medium for information still has many roles that will not totally disappear, at least not in the near future. However, the use of electronic text, graphics and images, due to their flexibility, continuous changing, and 'reusable' nature, is the way of the future (Grenier R. and Metes G. 1995). Today, even the numbers of e-mails transmitted and received by organisations are rapidly approaching the numbers of printed (paper) letters sent and received daily. That is to say emails:

- Have evolved to the point where graphics and text is virtually identical to the printed (paper) mailing;
- Are transmitted at a fraction of the cost of a printed version; and
- Are delivered widely and (almost) instantaneously to any location in the world (Schelberg N.S. and Weinstein S.D. 1999).

7.2.1.1 Transition

To ensure the successful transition from paper to electronic, the industry needs to 'crawl before it attempts to walk' the ICT road of technological change (Zipf P.J. 2000). By knowing what the problem is – i.e.: paper-based communication - and knowing what the solution is – i.e.: electronic / virtual communications - is simply not enough. Organisations need to investigate and fully understand how to transition from the one to the other. As a result, (Grenier R. and Metes G. 1995) recommend nine basic activities to help today's industry organisations design and construct a successful transition strategy:

- **Engage**: Top management launches a formal and objective process to examine the organisation's current situation and recognises that their business exists in the electronic / virtual environment.
- **Visioning**: Management collaboratively creates a vision of what the electronic / virtual future looks like and the role the organisation will play in it – then shared with the rest of the organisation.
- **Deciding**: Executive management decides and commits to the transition.
- **Consensus**: Management concentrates on getting the word out and building a consensus among the key 'influencers' in the organisation, including managers, technical specialists, hr professionals, etc.
- **Entire Organisation**: Management develops and initiates a process to introduce the concept of an electronic / virtual operation to the entire organisation, including information on the challenges, opportunities, expectations, tasks, training, etc.
- **Building a Planning and Designing Culture**: By example, training publicity, and on site leadership, management raises the organisation's awareness of the value of a planning and design approach to work.
- **Sensing Readiness**: Management examines key indicators of the organisation's readiness to gauge its current state and as a guide to select leaders.
- **Create a Prototype**: Management select two or three traditional 'weak' yet traceable areas or tasks in the organisation's performance, and then develop the specifications for a prototype project that will use electronic / virtual operations to perform similar tasks, whilst meeting aggressive business goals. The marketing, personnel, development, support, etc will need to be worked into the design of the prototype.
- **Commissioning a Project Leader**: Simultaneously, management identifies a project manager to lead the electronic / virtual team in the design of the new process and prototype - whilst ensuring the desired specifications are met, and delivery of new knowledge.

The above nine activities, are not necessarily undertaken in sequence, but rather in parallel – i.e.: an interacting and continuous process - and when undertaken with commitment by both senior management and employees, increases the probability of a successful transition throughout the organisation.

7.2.2 Improved implementation

Business success alone is insufficient for managers to justify the implementation of integrated ICT strategies, unless there is a strong support for such change from ICT champions (preferably senior management within the organisation). An organisation pursuing technological advancement, motivated only by profit maximisation (or other desirable financial objectives) is not enough. Many firms adopt ICT tools and systems for profit-motivated reasons and fail due to underestimating the difficult task of managing its impact upon organisation structures and cultures – i.e.: successful ICT adoption depends on the 'politics of technology' in its management in the organisation (Tantoush T. and Clegg S. 2001).

7.2.2.1 Guidelines

The feasibility and decision-making process of implementing a change / new ICT system within an existing organisation can be made easier by making use of the following guidelines:

- Maintain openness and honesty throughout the planning, design, development and implementation process.
- Encourage participatory planning in defining goals, objectives and in influencing the design or procurement of the new ICT system.
- Managerial support and involvement should be evident from the beginning to the end of the planning and implementation process.
- The goals for the change should be understood and viewed positively by all concerned.
- Overall benefits are to be maximised and efforts made to coordinate the goals of the new system with the existing goals of the organisation.
- There must be enough opportunities for education and training on using the new system as well as positive incentives for it.
- Both the organisation and new ICT system must be designed for the people who will use it (Paulson B.C. 1995).

7.2.2.2 Key issues

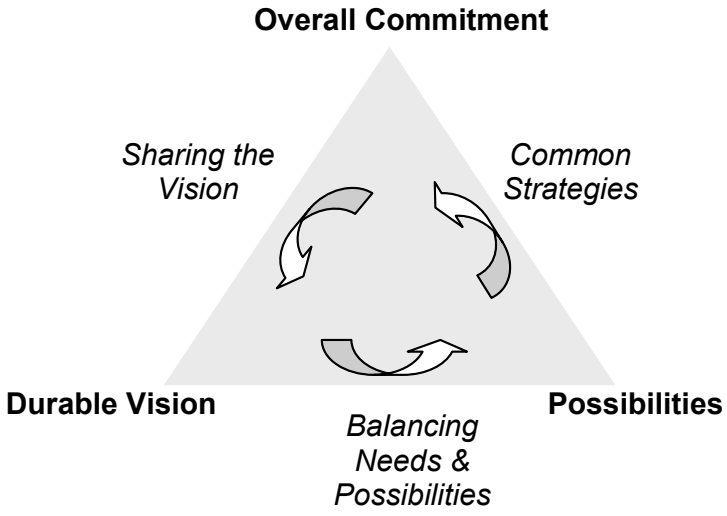
By investigating the practical ('real life') issues of integrating a new technology into the geographically dispersed Canadian health system successfully, five 'key issues' for ICT implementation were identified (Jennett P.A. and Andruchuk K. 2001). Although undertaken within the UK health sector, construction industry participants can channel the following lessons learnt and recommendations provided, and apply them to current / future ICT implementation projects:

- **Readiness of the environment**: The more prepared the environment, the more likely successful implementation will occur – i.e.: upfront recognition of: workstation and ICT standards (professional and technical); training requirements; ICT champions and onsite coordinators; hardware and software planning; as well as human requirements.
- **Analysis, strategic business plans and diverse partnerships**: Lessons learned and recorded experiences in academic literature need to be examined prior to implementation. Additionally, sustainability and accountability issues need to be included in a business case reflecting upon the need for any reengineering or reorienting of routines or processes. Finally, any public sector, private sector, research, academic and other industry organisation partnerships are to be recognised for the project.
- **Equipment and ICT vendors**: The purchasing (budget restriction) of compatible hardware, software and ICT equipment (standards, interoperability, interconnectivity, etc); renovating any space; and choosing appropriate vendors (providing maintenance, replacement, accountability and training) is described as one of the more challenging and important implementation issues.
- **Staged implementation**: A gradual / staged implementation process is recommended.
- **Evaluation**: Research identifies the lack of evidence and evaluation results, upon which to make implementation decisions, as a major impediment. Suggesting the compilation of a database on lessons learned (e.g. reporting on ongoing evaluation at each stage of the implementation process), and developing a set of best practice recommendations, to share with other industry members.

7.2.2.3 Three cornerstones of success

A study concerning the implementation of innovative ICT systems in Finnish construction companies identified ‘Three Cornerstones' of success and effect they have on a project (Figure 7.4).

Figure 7.4 Three Cornerstones of Successful ICT Implementation



Adapted from (Myllymaki R. 1997)

To follow, a few supporting comments on the various headings used in (Figure 7.4):

- **Vision**: A bright, durable vision of the new process is required to ensure progress, which initially can be created by a small close team, but later will need to be shared with top management, construction managers, developers and ICT staff.
- **Commitment**: Overall commitment needs to be obtained from top management, construction and ICT managers, that is, top management has to allocate both financial and human resources. The ICT department is also required to adjust ICT strategies to meet the requirements of the re-engineering efforts.
- **Possibilities**: Changing and re-engineering a company's existing information infrastructure could be the only way of maintaining a current market share or keep the current 'enterprise' alive. This can sometimes be a difficult and costly process – i.e.: cannot be based on ICT that does not yet exist yet, or that is simply too expensive. Applying a ‘migration strategy’ enables ICT staff to balance the ICT strategy with the companies business needs and thereby underwrite the success of the re-engineering process (Myllymaki R. 1997).

7.2.2.4 Four strategies

Construction industry executives and management need to consider the advantages and disadvantages of the following four possible ICT implementation strategies, and select the one that best serves the needs of the application and its users:

- **Total conversion at a fixed date**: The use of the old (existing) ICT system is stopped and the new one is started or put in its place, on a fixed date. This has the advantage of being

less stressful and trained users are ready to start immediately. The disadvantage is that if the implementation is poorly planned or the system is faulty, users may be demoralised.

- **Parallel operations with a gradual transition**: This strategy may be appropriate for a new and unproved ICT system. The advantage is that one can check the new results against the old to ensure that all is going well. The disadvantage is that double the effort is required in running both systems simultaneously and users may stall as long as possible to avoid learning the new system.
- **Phased implementation**: This allows separate modules to be added, over time, and eventually make up an integrated system. The advantage is that training and implementation workload can be distributed over a period where corrections and adjustments can be made. The disadvantage is the possibilities of difficulties when 'bridging' incompatibilities between the components of the old and new systems.
- **Pilot implementation**: This is when change leaders introduce the new system on a project that has interested and capable personnel, who have the motivation and initiative to try to make it succeed. The advantage is that two or more alternative packages can be tested concurrently and even if one of the pilot tests fail, or found to be unsatisfactory, the 'damage' is confined to one site. The disadvantage is that it is not suitable for centralised systems (Paulson B.C. 1995).

7.2.3 Overcome fear

Research shows there is also a ‘perceived fear’ of ‘exploitation’ of technology-led innovations within the industry, and that industry practitioners are yet to be convinced of supportive terms and conditions of contract do not lead to exploitation. In an attempt to lesson and ultimately remove this fear of exploitation, the industry is to determine ways to:

- Create a common understanding that would enable the construction industry to take positive action.
- Provide appropriate and easily accessible information on risk evaluation and implementation.
- Provide both cultural and contractual changes to remove the constant fear of liability and the concern to assign blame to individuals and organisations - creating an environment that is receptive to ideas, challenges and opportunities.
- Investigate unsuccessful projects to provide lessons for the future.
- Lessen constraints imposed by regulations, codes and standards that tend to oppose innovative solutions (CRISP 2000).

7.2.4 Provide direction

The following directions are identified as being critical to the successful take up of ICT in the construction industry:

- Maximise access to shared learning across the construction industry whilst using knowledge from other industries;
- Require information from suppliers in electronic form;
- Expecting electronic procurement to be used in all phases of project procurement and facilities management;
- Using advanced tendering systems which provide real time accessible information to all interested parties (speedier interaction);
- Driving process re-engineering through structural changes in procurement processes of governments;
- Working with industry to integrate ICT through the entire supply chain;
- Facilitate the use of ‘project Web sites’;
- Manage the use of ‘as-built’ information;

- Capturing and sharing information to better understand lifecycle costing;
- Adopt systems to share information in a usable form; and
- Resolve issues including: design copyright, intellectual property rights, confidentiality and commercial advantage (APCC 2000).

7.2.5 Improve benefits

To increase and strengthen the process of realising ICT adoption benefits, (Fujitsu Centre 1998) recommend:

- **Increasing awareness of, and skills to implement ICT–based strategic change by:**
  - developing and distributing case studies and best practice in moving from automation to strategic transformation in the construction industry;
  - developing and running short courses on capturing the benefits of ICT management innovations; and
  - developing and supporting a web-based 'help desk' on current best practice and available support.
- **Restructuring the industry supply chain to leverage ICT benefits by:**
  - commissioning an international comparative study of the impact of regulatory frameworks and effective inter-organisational ICT systems on industry structures; and
  - develop tender guidelines for Commonwealth and State Government projects that encourage ICT-enabled collaboration across the supply chain.
- **Supporting the database-centred approach by:**
  - providing support for the development of project-centred shared databases; and
  - supporting the development of standards enabling inter-operability.
- **Encouraging a performance-based, value-added focus for ICT use in the industry by:**
  - establishing industry-wide awards for ICT best practice;
  - supporting industry forums on the advantages of using ICT for value-added as apposed to cost-minimising ICT strategies; and
  - researching the contribution of regulatory changes to the adoption of ICT-based value added strategies by the industry.

In support of the above, (Mitropoulos P. and Tatum C.B. 2000) suggest the following 'actions' are to be taken by its participants to increase the rate of technological adoption within the construction industry:

- Increase external requirements: where customers mandate the use of specific technologies;
- Create 'problems': when measuring the performance of work processes – identify problem areas and initiate change. One strategy is by setting high performance goals or 'artificial problems' to initiate change;
- Increase potential for competitive advantage: where construction customers consider the contractors technological capabilities as a criterion in selection;
- Increase technological opportunities: dictated by the understanding of its benefits, availability of resources and organisational capabilities;
- Closer cooperation between technology developers and contractors: required to develop technologies that address the contractors operational needs; and
- Reduce the contractor's initial costs and costs of failure: by all project participants sharing the costs, risks, and benefits of new technologies.

7.3 Training and Education

Construction industry organisations need to become learning organisations - attuned to absorbing and using knowledge and providing for lifelong learning. Investing in human capital,

to bridge the skills gap, in research and development, and knowledge awareness, will help to maintain competitiveness. Within the next ten to twenty years, the construction industry will require a complete range of different skills. To meet these needs, a 're-think' in the way construction education is organised to deliver these skills is required, due to computer and ICT integration of construction processes, implying a need for 'cross-disciplinary education' (Foresight 2000).

The necessity to recognise the culture of an organisation and its effect on training (and its evaluation) is essential. Trainers are recommended to consider the following 'action points' to help address this issue (Lewis P. and Thornhill A. 1994):

- firstly, attempt to understand the organisation's culture and organisational attitudes to training evaluation;
- recognise all levels of the organisation's culture in order to consider how positive attitudes can be fostered at all of these;
- determine measurable goals for changing attitudes to training in the organisation in relation to time;
- utilise (amongst other things) Forces of Resistance (Table 4-1) to help analyse the extent of the problem, the task to be undertaken, and how to bring about change;
- adopt a proactive approach to the advancement of organisational-level training and evaluation by 'promoting' this to senior management and by forging links with line managers and other key players in order to effect new organisational 'beliefs';
- choose a suitable change strategy or strategies to promote these new organisational beliefs;
- involve a wide range of organisational participants in the implementation stage of the attempt to change attitudes; and lastly
- actively evaluate the results of this culture change attempt.

Furthermore, to ensure efficient and continued use of, for example, a new ICT system, trainers need to consider the possible negative effects associated with training potential end users, including:

- fear and stress of employees (old and young) having to learn an unfamiliar / automated process; and
- impact on their self-esteem and ability to succeed (threatened confidence) (Vickers M.H. 1999).

Finally, there is also an equally significant role for tertiary education to develop and support the understanding of how to evaluate and implement technological change and innovation. This provision is required both in undergraduate / postgraduate courses to create a more receptive and able cadre of construction professionals (including the creation of a more common understanding) as well as the role of providing specific research and consultancy support to companies or networks (CRISP 2000). Training can be offered through, for example, innovative synchronised and instructor-led training systems with video, audio and graphical presentations, allowing fuller learning participation from any location. Furthermore, it is predicted that higher quality online training and courseware (meeting the ever-broadening needs of industry learners and organisations) will become, and in many cases already is, a standard method of training, thereby altering the adult learning experience in future decades (Kilby T. 2001).

8 FUTURE RESEARCH

Debatably, this research indicates today's businesses and personal worlds are being increasingly 'dominated' by a wide range of ICTs and Internet-based activities. The ICT revolution and its dramatic impact on today's communication practices will undoubtedly continue to transform the way the industry operates. Yet, even though these innovative ICT tools and systems have a great deal to offer, and despite increased international research and development (R&D) activities, today's construction industry ever-present resistance to change, and need to improve current / traditional communication and information processes, is still convincing.

Potential ICT benefits identified, and competitive advantages experienced through the electronic distribution of project related documentation and information within a 'virtual' team, will undoubtedly continue to transform the way the industry operates in the future. More importantly, researchers agree the success of any profession is going beyond simply exchanging electronic information. That determining new and improved ways of doing business is dependent on the innovation of the user, not only the technology itself - requiring careful consideration and a greater emphasis to the '*human touch*' (Gore Jr E.W. 1999; Ahmad I. 2000; Claver E., Llopis J. et al. 2001).

Yet, for one of the oldest industries to change its traditional ways of '*doing things'* (culture), and to embrace innovative technologies and processes, seems to be an ongoing challenge. Unless one can uncover and expose the fundamentals of these ongoing 'restraining forces', there is little hope of successfully implementing permanent cultural change within the construction industry (Black J. S. and Gregersen H. B. 2002).

"*We know a great deal about the technical aspects of being 'virtual' - we now need to know more about making the human and teams, more virtuous*"
(Furst S., Blackburn R. et al. 1999).

In an attempt to demonstrate leadership in facilitating the use of innovative Information and Communication Technology (ICT) in virtual building and civil construction teams, an on-going and in-depth PhD investigation looks at AEC industry specific organisations and project team member values, attitudes and beliefs, etc. towards a technology driven culture change. Research focuses on identifying and clarifying the 'need' for change, whilst examining the cultural and sub-cultural 'threats' and 'opportunities' that challenge the successful uptake of innovative ICT solutions within and between organisation and project teams. Whilst considering various proven and innovative change methods / processes (similar to those highlighted in this report), PhD investigations will help researchers develop, test, trial and evaluate an effective and, AEC industry specific 'Culture Change Framework'. A framework that team leaders can strategically put into practice to help determine an overall level of team member 'readiness' to adopt innovative ICT solutions.

9 CONCLUSION

Culture inevitably is difficult to change and manage, as it essentially represents the accumulative beliefs, attitudes and values that individuals within an organisation, group or team possess, which must ultimately be changed if the overall culture is to be changed. Leaders of a change process need to realise that most changes within an organisation will usually cause and expect some change in its existing culture and sub-cultures – i.e.: change in certain values, attitudes, assumptions, and behaviours, etc. Therefore, having a better understanding of the effects change has on the sub-cultures of an organisation, group or team, will inturn help leaders of a change process better understand the resistance towards the change itself, and provide a more realistic approach on how to manage it.

Due to the nature of the AEC industry, the successful changing of its culture requires clear leadership and commitment from the most senior level of the organisation, group or team throughout a change process, and if required, supported by external consultants. Furthermore, when trying to change what people 'think' or 'do things' from an organisation-wide perspective, the change process will be successful, but only if it is strategically led – i.e.: when organisations undertake a strategic review early in the change process and, in this way, link culture change to organisational effectiveness. Both managers and employees need to make senior executives more aware of the cultural implications of a strategically led change, and help identify and select the selection, reward, and induction and training programs. However, if general employees are to make an effective contribution to a successful cultural change, they need a better understanding of the organisations overall strategy, vision and commercial awareness, and how this change will effect their current and traditional 'way of doing things' (Williams A., Dobson P. et al. 1993).

Through continued efforts in identifying ways to overcome the construction industry's resistance to change, by modifying traditional work habits, by improving current technical limitations, and by encouraging the use of innovative ICT and Internet-based solutions, will undoubtedly help increase the overall knowledge, awareness and skills, of all industry stakeholders, in bringing about cultural change. This will result in a major social and technological impact that will integrate the construction industry in a unique, distinctive, and never before experienced way.

"If you are serious about managing culture in your organisation, the biggest danger you face is that you not fully appreciate the depth and power of culture."
(Schein E. H. 1999) p185

10 BIBLIOGRAPHY

Ahmad I. (2000). "Success in the Wake of the IT Revolution, IT Manager for Florida International University." Journal of Management in Engineering **January/February**.

Anumba C.J. and Ruikar K. (2002). "Electronic Commerce in Construction: Trends and Prospects." Automation in Construction **11**.

APCC (2000). Directions for IT in the Construction Industry - South Australia. Canberra, Australia, Commonwealth of Australia - Australian Procurement & Construction Ministerial Council (APCC).

Baines A. (1998). "Creating a Culture of Ownership." Work Study **47**(1).

Bate P. (1996). Strategies for Cultural Change. Oxford, Butterworth Heinemann.

Black J. S. and Gregersen H. B. (2002). Leading Strategic Change: Breaking Through the Brain Barrier. New Jersey, Pearson Education Inc.

Buch K. and Wetzel D.K. (2001). "Analysing and Realigning Organizational Culture." Leadership & Organization Development Journal **22**(1).

Cabrera A., Cabrera E.F., et al. (2001). "The Key Role of Organisational Culture in a Multi-System View of Technology-Driven Change." International Journal of Information Management **21**(3).

Carucci R. A. and Pasmore W. A. (2002). Relationships that Enable Enterprise Change. San Fransisco, Jossey-Bass/Pfeiffer Inc.

Claver E., Llopis J., et al. (2001). "The Performance of Information Systems Through Organisational Culture." Information Technology and People **14**(3).

Cleveland Jr. A.B. (1999). "Knowledge Management: Why It's Not an Information Technology Issue?" Journal of Management in Engineering(November/December).

Cooper C.L. (1999). "Can We Life with the Changing Nature of Work?." Journal of Managerial Psychology **14**(7/8).

CRISP (2000). The Contribution that Technological Change could make to meeting the Objectives of Rethinking Construction: The Product (99/17). UK, Prepared by Ove Arup & Partners for the Construction Research and Innovation Strategy Panel (CRISP) Commission.

CRISP (2000). Report on a Workshop: Technological Change and Rethinking Construction. UK, Prepared by Lorch Associates for the Construction Research and Innovation Strategy Panel (CRISP) Commission.

Cross R. and Baird L. (2000). Technology is not enough: Improving Performance by Building Organisational Memory (US). Sloan Management Review. **41**.

Duarte D. L. and Snyder N. T. (2001). Mastering Virtual Teams: Strategies, Tools, and Techniques that Succeed. San Fransisco, Jossey-Bass Inc.

Flanagan R. (1998). Creating Competitive Advantage In Construction With Technology. Second International Conference on Construction Project Management, Critical Issues and Challenges Into The Next Millennium (February 19-20), Raffles City Convention Centre, Singapore.

Foresight (2000). Constructing the Future: Making the Future Work For You. UK, Foresight, Built Environment and Transport Panel, Construction Associate Programme.

Fujitsu Centre (1998). Information Technology in the Building and Construction Industry: Current Status and Future Directions. Australia, Prepared by Fujitsu Centre, Australian Graduate School of Management & Building Research Centre Faculty of the Built Environment, University of New South Wales, for the National Building & Construction Committee, Department of Industry, Science & Tourism (DIST).

Furst S., Blackburn R., et al. (1999). "Virtual Team Effectiveness: A Proposed Research Agenda." Information Systems Journal **9**.

Gann D. (1997). Technology and Industrial Performance in Construction. Brighton, UK, Prepared by University of Sussex, for OECD Directorate for Science, Technology and Industry.

Gilley J. W. and Maycunich A. (2000). Beyond the Learning Organization. New York, Perseus Books.

Gore Jr E.W. (1999). "Organizational Culture: TQM, and Business Process Reengineering - An Empirical Comparison." Team Performance Management: An International Journal **5**(5).

Graham M.B.W. (1996). "Changes in Information Technology, Changes in Work." Technology in Society **18**(3).

Grenier R. and Metes G. (1995). Going Virtual: Moving Your Organisation into the 21st Century, Prentice Hall Inc.

Gupta A. and Thomas G. (2001). "Organisational Learning in a High-Tech Environment: From Theory to Practice." Industrial Management & Data Systems **101**(9).

Hee H. (1998). Information Technology & The Deployment of CAD Systems: An Enabler Or Disabler of Construction Management? A Critical Appraisal of Its Impact On Design & Build Projects In Singapore. Second International Conference on Construction Project Management, Critical Issues and Challenges Into The Next Millennium (19-20 February), Raffles City Convention Centre, Singapore.

Hensey M. (2001). Collective Excellence: Building Effective Teams. Virginia, American Society of Civil Engineers (ASCE) Press.

Hiley M. (2001). "Just the Job." Industrial and Commercial Training **33**(6).

Hughes T., Williams T., et al. (2000). "It Is Not What You Achieve, It Is The Way You Achieve It." Total Quality Management **11**(3).

Jennett P.A. and Andruchuk K. (2001). "Telehealth: 'Real Life' Implementation Issues." Computer Methods and Programs in Biomedicine **64**.

Joiner T.A. (2001). "The Influence of National Culture and Organizational Culture Alignment on Job Stress and Performance: Evidence from Greece." Journal of Managerial Psychology **16**(3).

Kaarst-Brown M.L. and Robey D. (1999). "More Myth, Magic and Metaphor: Cultural Insights into the Management of Information Technology in Organizations." Information Technology & People **12**(2).

Kilby T. (2001). "The Direction of Web-Based Training: a Practitioner's View." The learning Organisation **8**(5).

Lewis P. and Thornhill A. (1994). "The Evaluation of Training: An Organizational Culture Approach." Journal of European Industrial Training **18**(8).

Line M.B. (1999). "Types of Organisational Culture." Library Management **20**(2).

Linowes J.G. (1999). "How to Succeed in a World Dominated by Cyberspace Communications." Journal of Management in Engineering(May/June).

Linowes J.G. (1999). "Invest in the Best, Communications." Journal of Management in Engineering(November/December).

Maull R., Brown P., et al. (2001). "Organisational Culture and Quality Improvement." International Journal of Operations & Production Management **21**(3).

Meudell K. and Gadd K. (1994). "Culture and Climate in Short Life Organizations: Sunny Spells or Thunderstorms?" International Journal of Contemporary Hospitality Management **6**(5).

Michel H.L. (1998). "The Next 25 Years: The Future of the Construction Industry Communications." Journal of Management in Engineering(September/October).

Mitropoulos P. and Tatum C.B. (2000). "Forces Driving Adoption of New Information Technologies." Journal of Construction Engineering and Management(September/October).

Morley M. and Heraty N. (1995). "The High-Performance Organisation: Developing Teamwork Where It Counts." Management Decision **33**(2).

Myllymaki R. (1997). The Implementation of Information Systems In A Construction Company Using New Information Technologies. International Conference on Construction Process Re-engineering (July 14-15), Gold Coast, Queensland, Australia.

O'Donaghue A. (2001). "Motivational Training Hits New Heights." Industrial and Commercial Training **7**(5).

Olesen K. and Myers M.D. (1999). "Trying to Improve Communication and Collaboration with Information Technology: An Action Research Project Which Failed." Information Technology and People **12**(4).

Palmer I., Dunford R., et al. (2001). "Changing Forms of Organizing: Dualities In Using Remote Collaboration Technologies in Film Production." Journal of Organizational Change Management **14**(2).

Paulson B.C. (1995). Computer Applications in Construction. Singapore, McGraw-Hill, Inc.

Pepper G. L. (1995). Communications in Organizations: A Cultural Approach, McGraw-Hill Inc.

Rethinking Construction (2000). A Commitment to People: "Our Biggest Asset". UK, Report from the Movement of Innovation's working Group on Respect for People, Rethinking Construction, Department of Trade & Industry.

Revenaugh D. L. (1994). Implementing Major Organizational Change:Can We Really Do It? The TQM Magazine. **06**.

Sadri G. and Lees B. (2001). "Developing Corporate Culture as a Competitive Advantage." Journal of Management Development **20**(10).

Schein E. H. (1997). Organizational Culture and Leadership. San Fransisco, Jossey-Bass Inc.

Schein E. H. (1999). The Corporate Culture Survival Guide. San Fransisco, Jossey-Bass Inc.

Schelberg N.S. and Weinstein S.D. (1999). "Paperless Benefit Plan Administration in the New Millennium." Employee Benefits Journal **24**(4 - December).

Schneider W.E. (2000). Why Good Management Ideas Fail: The Neglected Power of Organisational Culture. Strategy & Leadership.

Swe V. and Kleiner B.H. (1998). "Managing and Changing Mistrustful Cultures." Industrial and Commercial Training **30**(2).

Tantoush T. and Clegg S. (2001). "CADCAM Integration and the Practical Politics of Technological Change." Journal of Organizational Change Management **14**(1).

Tata J. (2000). "Autonomous Work Weans: An Examination of Cultural and Structural Constraints." Work Study **49**(5).

Thorpe T. and Mead S. (2001). "Project-Specific Wed Sites: Friend or Foe?" Journal of Construction Engineering and Management(September/October).

Unknown (1997). "Will the Team Ethic Fit Within Your Organisation's Culture?" Work Study **46**(4).

Uren D. (2001). IT Benefits Don't Lie in the Hardware and Software: The Profits to be Won from Investment in IT depend upon Organisational Change. Weekend Australian. Brisbane, Australia**:** 50.

Vickers M.H. (1999). "Information Technology Development Methodologies - Towards a Non-Positivist, Development Paradigm." The Journal of Management Development **18**(3).

Webster (1956). Webster's New World Dictionary. London, Macmillan & Co Ltd.

Whyte J. (2002). Virtual Reality and the Built Environment. Oxford, Architectural Press.

Williams A., Dobson P., et al. (1993). Changing Culture: New Organisational Approaches. London, Institute of Personal Management (IPM).

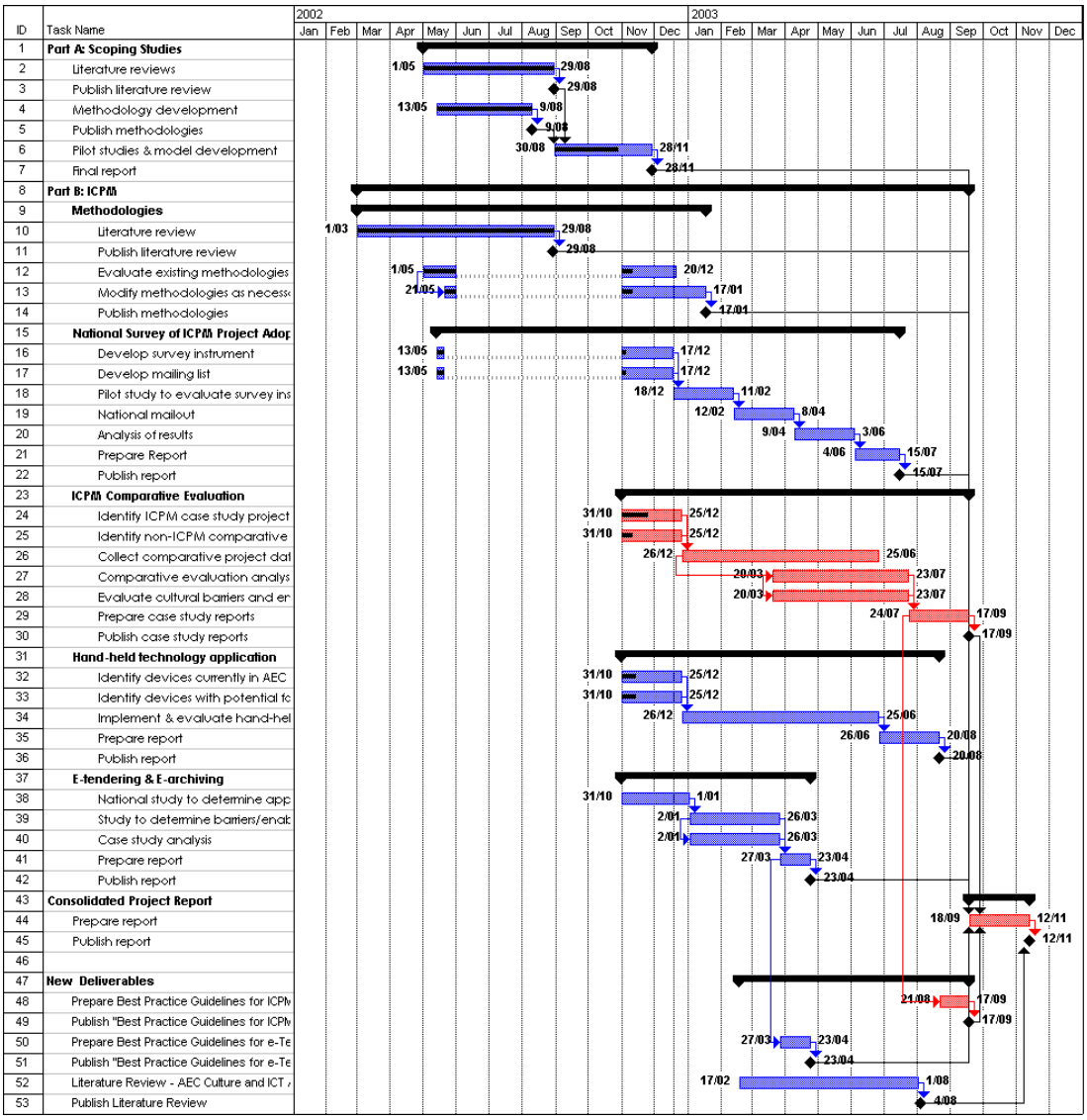
Youngblood M.D. (2000). "Winning Cultures for the New Economy." Strategy and Leadership(28 June).

Zipf P.J. (2000). "Technology-Enhanced Project Management." Journal of Management in Engineering(January/February).

11 APPENDICES

Appendix I: 2001-008-C Project Schedule

Figure 11-1: 2001-008-C Project Schedule



Appendix II: Additional Organisational Cultures

Core Culture:

While no organisation has 'one pure culture' throughout, (Schneider W.E. 2000) believes that every successful organisation has a 'core culture' which is critically aligned with the organisation's strategy and its core leadership practices – i.e.: a culture that is central to the functioning of the organisation, forming the nuclear centre for how that organisation operates in order to succeed. As a result the following four 'core cultures' are identified in Table 11-1 (showing their relation between strategy, leadership and central understanding). The four core cultures identified are:

- Control: based on a military system, with power as the primary motive.
- Collaboration: emerging from the family and/or athletic team system, in which the underlying motive is affiliation.
- Competence: derived from the university system, with the fundamental motive of achievement.
- Cultivation: growing from religious system(s) and motivated by growth or self-actualisation.

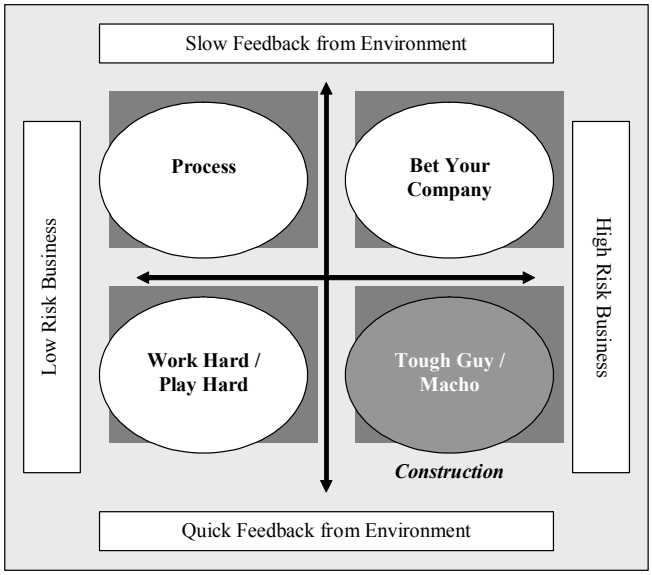
Table 11-1: 'Core' Cultures

ORGANISATIONAL CULTURE			
CORE	**STRATEGY**	**LEADERSHIP**	**CENTRAL UNDERSTANDING**
Control	• Market-share dominance • Commodity • Commodity-like • High distribution intensity • Life and death • Predictability	• Authoritative • Directive • Conservative • Cautious • Definitive • Commanding	• Certainty • Organisational systematism - the fundamental issue is to preserve, grow, and ensure the well-being and success of the organisation
Collaboration	• Synergistic customer relationship • Close partnership with customer • High customisation • Total solution for one customer • Incremental, step-by-step, relationship with customer	• Team builder • First among equals • Coach • Participative • Integrator • Trust builder	• Synergy • Experiential knowing - the fundamental issue is the connection between people's experiences and reality
Competence	• Superiority • Excellence • Extremely unique • Create market niche • Constant innovation to stay ahead	• Standard setter • Conceptual visionary • Taskmaster • Assertive, convincing persuader • Challenger of others	• Distinction • Conceptional systematism - the fundamental issue is the realisation of conceptual goals, especially superior, distinctive conceptual goals
Cultivation	• Growth of customer • Fuller realisation of potential • Enrichment of customer • Raise the human spirit • Further realisation of ideals, values, higher-order purposes	• Catalyst • Cultivator • Harvester • Commitment builder • Steward • Appeal to higher-level vision	• Enrichment • Evaluation knowing - the fundamental issue is the connection between the values and ideals of the organisation and the extent to which those values and ideals are being implemented

Culture Tribes:

(Revenaugh D. L. 1994) refers to four 'tribes' of corporate cultures (Figure 11-2 and Table 11-2):

Figure 11-2: Corporate Culture 'Tribes'



(Revenaugh D. L. 1994)

Table 11-2: Corporate Culture 'Tribes' Defined

CORPORATE	
TRIBE	**CULTURE**
Tough-guy / Macho	: Organisations that have a '*high risk / quick feedback*' environment (*find a mountain and climb it)*. Typical industries include advertising, entertainment and ***construction***.
Work hard - Play hard	: Organisations operating in a '*low risk / quick feedback*' environment (*find a need and fill it*). Typical industries include retail and sales.
Bet your company	: Organisations operating in '*high risk / low feedback*' environments (*play it safe*). Typical industries include oil, drugs, aerospace and public utilities.
Process	: Organisations operating in 'low risk / slow feedback' environments (be perfect). Typical industries include banking, insurance and government departments.

Culture Themes:

Four 'main themes' of organisational culture are identified and discussed in (Maull R., Brown P. et al. 2001):

- Learned entity: the culture is 'taught' to new members of the organisation as 'the correct way to behave', and as a result 'perpetuating organisational survival and growth';
- Belief system: two fundamental beliefs form part of this culture 'theme':

- Guiding belief: described as the 'nitty-gritty' beliefs of 'everyday life' that rarely change as they are in the 'realm of universal truth' and provide direction to the daily beliefs.
- Daily beliefs: described as the 'rules and feelings of everyday behaviour, continuously changing to match context.

- Strategic: where culture change is described as a strategic change and any strategic formulation is a cultural activity – i.e.: to propose an attempt to implement a 'separate culture change program' within an organisation will fail due to a cultural change already taking place within formal and informal strategic planning processes.
- Mental programming: emphasising this culture is:
  - Collective: with shared values and with no individual characteristics;
  - Mental 'software': invisible and intangible;
  - Interesting: as it differentiates between categories of people.

Classic v Quantum Culture:

(Youngblood M.D. 2000) states that organisations are machines for producing profit, and people are the cogs of that machine, identifying two types of cultures (Table 11-3):

Table 11-3: Classic v Quantum Culture

COMPARATIVE MEASURES	CULTURE TYPES	
	CLASSIC	QUANTUM
Central metaphor	: Machines	: Natural systems
Attitudes towards people	: Must be managed, controlled, not trustworthy; must be given incentive and driven to do good work	: Capable, trustworthy, creative, and committed to doing great work
Strategy	: Centralised, fixed	: Emergent, opportunistic, flexible
Structure	: Hierarchy	: Network
Leadership	: Leaders are rare, heroic people who are all-knowing and who are expected to drive the company to achieve results	: Leadership is a distributed phenomenon; results are achieved by creating an environment where ingenuity, creativity, and responsibility can thrive
Management	: Command and control methods are used to meet planned levels of performance	: Employees operate with a high level of autonomy and are coached to produce extraordinary results in surprising ways
Culture	: Unimportant; given little or no attention	: Vital to success; significant time and energy given to it
Renewal	: Focus on extending existing business model by doing more of what's already being done - only better	: Focus on creating breakthrough innovations that change the rules or create whole new markets
Agility	: Slow, inward focused, unresponsive	: Fast, extremely focused, very responsive
Vitality	: Employee welfare is secondary to financial concerns; motivation through economic benefits	: People are treated equal to or above financial concerns; motivation through an inspiring vision and ability of everyone to contribute

From the above descriptions, it is clear that 'classic cultures' do not suit today's competitive environment as they are unable to deliver the speed, creativity and responsiveness needed to compete effectively. Therefore, unattractive to trained and talented employees required by companies. On the other hand,' quantum cultures' successfully adapted to change by developing new ways of thinking and working (e.g. by implementing innovative ICTs). Thereby producing 'quantum leap' results ahead of most other industry competitors (Youngblood M.D. 2000).

Culture Metaphors:

(Line M.B. 1999) makes use of the following animal metaphors to describe organisational cultures, identifying the 'cat culture' as the most appropriate for surviving in the 'animal business world' (Table 11-4):

Table 11-4: Animal Cultures

ORGANISATIONAL CULTURES	
METAPHOR	**DESCRIPTION**
Lion	• Leader in its field • Dominating without a great deal of effort
Chimpanzee	• Highly intelligent, aggressive yet co-operating with one another to survive • Constant power struggle – the head therefore can never feel secure.
Bonobos *(pygmy chimpanzee)*	• Easily mixes and bonds with other Bonobos • Flourish only in special habitats • Strong corporate spirit • Endangered
Gorilla	• Gentle • Playful • Non-aggressive • Cohesive • Few internal conflict • Size and appearance frighten others.
Hyena	• Not pleasant • Kills if necessary • Scavenger.
Wolf	• Hunt in packs • Obey leaders • No ability (or wish) to think for themselves • Enduring loyalty • Sense of common and undisputed purpose • Feared by others.
Cow	• Pathetic • Leader (bull) is fearsome yet generally placid • Limited vision • Attacking for no reason • Unadventurous • Limited range of activity and potential.
Sheep	• A powerful ram as a leader to see of rivals in no uncertain manner • No direction • Easily managed • Liable to panic when faced with even imaginary threats • Productive within their own limits.
Elephant	• Long lasting • Provide mutual support • Cannot be bullied • Tend to be undiscriminating and roughly trample over territories.
Cat *(most desirable)*	• Independent • Willing to work in groups – yet comfortable being on their own • Flexible • Democratic – deciding on the basis of self interest • Loyal only to themselves • Adaptable • Curious • Will not hesitate to leave • Make their wants felt • Not easy to manage - over management is counter productive producing 'stagnation'.

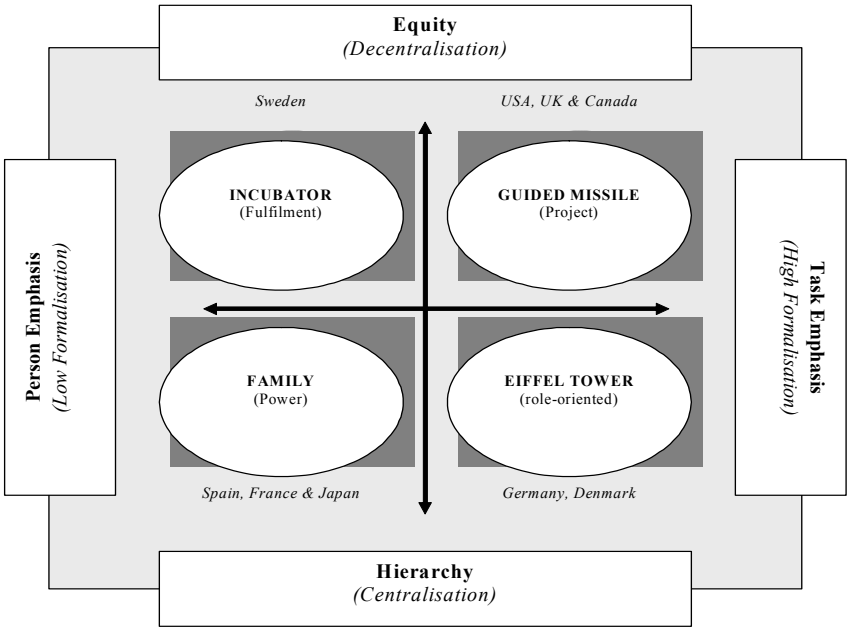
International Culture

From an international perspective, (Joiner T.A. 2001) researchers compare the organisational cultures of nine different countries by referring to four International culture types (Table 11-5 and Figure 11-3):

Table 11-5: International Organisational Cultures

	COMPARATIVE DESCRIPTION
The Family (power-oriented)	: characterised by strong emphasis on the hierarchy and an orientation toward the person. Individuals are expected to perform their tasks as directed by the leader, who may be viewed as the caring parent. Subordinates not only respect the dominant leader or father figure but they also seek guidance and approval.
The Eiffel Tower (role-oriented)	: strong emphasis on the hierarchy and an orientation toward the task characterises this culture. The 'Eiffel Tower' image symbolises the typical bureaucracy - a tall organisation, narrow at the top and wide at the base where roles and tasks are clearly defined and coordinated from the top. Authority is derived from a person's position or role within the organisation, not the person as such.
The Guided Missile (task-oriented)	: characterised by a strong emphasis on equality and an orientation toward the task ('getting things done'). Organisation structures, processes and resources are all geared toward achieving the specified task/project goals. Power is derived from expertise rather than the formal hierarchy.
The Incubator (fulfilment-oriented)	: characterised by a strong emphasis on equality as well as an orientation toward the person. The purpose of the organisation is to serve as an incubator for the self-expression and self-fulfilment of its members.

Figure 11-3: International Organisational Cultures



(Joiner T.A. 2001)

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Mr Weippert is presently undertaking a PhD to identify key cultural ‘drivers’ or ‘enablers’ of ICT uptake within ‘virtual’ building and civil project team environments. He is also a Research Associate to Dr Stephen Kajewski (Project Leader) for the Cooperative Research Centre (CRC) for Construction Innovation research project 2001-008-C: ‘Project Team Integration - Communication, Coordination and Decision Support’. Prior to this appointment, he was Research Assistant to Dr Stephen Kajewski (Project Manager) on the Online Remote Construction Management (ORCM) research project. The ORCM project was a major research project undertaken by the Queensland University of Technology (QUT) and Commonwealth Scientific Industrial Research Organisation (CSIRO) Construction Research Alliance (CRA), based at QUT, Brisbane, Queensland, Australia.